CALGARY RIVER VALLEYS PLAN

SUPPORTING INFORMATION

TO

THE PLAN AND POLICIES

DRAFT

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For Reference Purposes:

"NOSE CREEK VALLEY OPEN SPACE" PLAN
(approved by City Council on July 23, 1979)

A AN OVERALL PICTURE OF THE RIVER SYSTEMS IN CALGARY

The following information related to the Bow and Elbow Rivers, and the Nose and West Nose Creeks is provided to allow the reader to gain an appreciation of the similarities and differences between each of the watercourses within the city limits.

A1 Physical Characteristics:

The Bow River, after entering the city from the northwest, flows in an easterly direction for about 15 miles/24 km to the Western Irrigation District Weir. At this point, the river flows in a southerly direction for nearly another 13 miles/20.8 km before leaving the city about 3/4 mile/1.2 km south of its confluence with Fish Creek. Within the city limits, the Bow River is joined by two tributaries, the Elbow River and Nose Creek, which have respective drainage areas of 471 and 345 square miles (1,220 and 894 sq. km).

The Elbow River enters the City of Calgary at the extreme west end of Glenmore Reservoir. Downstream from Glenmore Reservoir the river flows in a northeasterly direction for about 7 miles/11.2 km to its confluence with the Bow River. Compared to the swiftly running Bow River with an average flow of 3.2 ft./1.0 m per second, the Elbow River's average flow is only 2.2 ft./0.7 m per second. It has several meandering reaches throughout the southwest part of the city.

The Bow and Elbow Rivers have well defined and fairly steep banks ranging between 15 ft./4.6 m and about 120 ft./36.6 m in height. In both cases, water temperatures vary between $0^{o}C$ (winter) and $15^{o}C$ (summer). Generally, the Bow River valley has three continuous levels of terraces. Between 85 Street N.W. and the Bonnybrook Bridges, the river channel is partly entrenched and frequently confined. The channel of the lower reach between the Bonnybrook Bridges and Fish Creek is also sinuous with frequent islands. There are several gravel bars and islands along the Bow River, with Prince's Island, St. Patrick's Island and St. George's Island being the largest within the city limits. Excepting Prince's Island, St. George's and St. Patrick's Islands (Calgary Zoo), all the islands are predominantly in their natural state with poplars, various willows and shrubs and an understory of native grasses. The riverbanks are moderately unstable and the valley flat is sparsely treed.

The banks of the Elbow River are moderately steep, unstable and eroded in some locations. The river channel is sinuous with some geological outcrops. There are four islands, Elbow Park Island at 4 Street S.W. being the largest.

A2 Water Quality:

All discharges along the rivers require authorization by the Alberta Department of the Environment. Along the Elbow River, discharges are restricted to storm sewer outlets with no apparent adverse impact on the water quality. Concerning the Bow River downstream from the Bonnybrook Bridges, the effluents from the Bonnybrook and Fish Creek Sewage Treatment Plants cause the levels of bacteria, phosphorous and nitrogen to rise above provincial objectives. As a result, water is unsuitable for primary (body) contact recreation in certain reaches of the Bow River. The Bow and Elbow Rivers are the major sources of water supply for the City of Calgary.

The quality of Nose and West Nose Creeks is impaired and the provincial objectives have not been met regarding the phosphorous, dissolved solids and coliform bacteria. Therefore, these two streams are unsuitable for primary (body) contact recreation.

A3 Existing Land Uses:

The Bow River floodplain along its upper reach (Bowness Park-Inglewood Golf Course), about 13 miles/20.8 km (26 miles/41.6 km of river frontage), has been developed for public parks which cover approximately 19.2 miles/ 30.8 km of river frontage. The remaining 6.8 miles/ 10.8 km of river frontage is developed for vehicular traffic use, commercial, industrial and housing development. Along the lower reach (Inglewood Golf Course - S.E. city limits), approximately 13 miles/20.8 km, there is little development of a structural nature though extensive areas have been used for gravel mining operations. Most of the floodplain is designated under the Land Use By-law as Direct Control, Agricultural and Open Space, or Urban Reserve Districts.

The Elbow River valley between the Glenmore Dam and its confluence with the Bow River is intensively developed with single-family houses, multiple family apartments, and commercial and industrial buildings. In addition, there are linear parks and major public recreational areas such as Glenmore Athletic Park, Sandy Beach/River Park, Stanley Park, Britannia Park, Lindsay Park and a private golf course adjacent to the river. Public parks along the river occupy about 9.2 miles/14.8 km of the approximate total of 14 miles/22.4 km of river frontage.

The floodplain of the Elbow River is variously designated as Agricultural and Open Space, Single Detached Residential, Direct Control, Low Density Residential, Medium Density Multiple Dwelling and General Light Industrial Districts. A serious flood has not occurred for many years and properties along the river have been improved with several new buildings erected.

General land uses in the Nose Creek valley between the Bow River and 80 Avenue N.E. are: parklands (developed and undeveloped), a C.P.R. main line, major transportation corridors, a golf course, industrial development, storage of junk materials on undeveloped (vacant) lands and very little residential development. Further north, between 80 Avenue N.E. and the current city limits, the major land uses adjacent to Nose Creek are agricultural with two east-west roadways crossing the creek. In the case of the West Nose Creek valley, the main land uses are agricultural, undeveloped lands and two roadways.

A4 Recreation Potential:

The Elbow River with its moderately steep banks, small size, low water flow levels, and location adjacent to developed areas has limited land and water-based recreational capacity at a regional level. The capacity for recreational purposes on and along the Bow River is somewhat restricted where there is no public (separate walkway/pathway R.O.W.) access to the river. Where there is access to the river valleys via walkways/ pathways, roadways or public parks, the river valleys are intensively used by recreationists for active and passive recreational activities. Bowness Park, Prince's Island, Fort Calgary and the Zoo islands (St. Patrick's and St. George's Islands) receive extensive recreational use and are recognized as major tourist attractions in the City of Calgary.

During the summer months swimming is possible in certain parts of the Elbow River while it is hazardous to swim in the Bow River at all times. During the winter months, cross-country skiing along the riverbanks and in the Nose and West Nose Creek valleys is a popular recreational activity. Additionally, skating takes place on the lagoon in Bowness Park.

B IDENTIFICATION OF PROBLEMS, OPPORTUNITIES AND POLICY DIRECTIONS

B1 LAND USE PLANNING

B1.1 OPEN SPACE IN THE RIVER/CREEK VALLEYS:

B1.1.1 REGIONAL OPEN SPACE

B1.1.1.1 Calgary's rivers and creeks represent the single most positive recreational asset of the city. The potential for a comprehensive open space system along the rivers/creeks is enormous and directly concerns the objectives of this plan. The creation of such a system would contribute to the harmonious and diverse use of creek/riverbank parkland, provide a broad spectrum of recreational opportunities to cater to and satisfy the various recreational aspirations and needs of Calgarians, and heighten public awareness of the distinctive and natural characteristics of the riverine environment. A comprehensive open space system will ensure the optimum realization of recreational opportunities for the benefit of the people.

Two major components of the open space system, public access and natural areas, are discussed in Sections B1.1.2 and B1.1.3.

For the purpose of this report, an 'open space system' refers to a series of large open space units which are entirely contiguous or are wholly or partially connected by smaller, linear open spaces. The distinct areal units and linear parks serve specific but complementary needs regarding recreational use.

B1.1.1.2 Existing Policies and Statutory Requirements:

Consideration for the provision of public open space in Calgary exists in a number of policies and statutory requirements currently in effect. The Planning Act, 1977 requires the provision of 10% municipal and/or school reserves for subdivision of land containing more than 2 acres (0.8 ha). The use to which such land may be put is stated as follows:

> "M nicipal reserve or school reserve or municipal and school reserve may only be used by a council or a school authority or by them jointly for all or any of the following purposes:
>
> (a) a public park, or
> (b) a public recreation area, or
> (c) school purposes, or
> (d) to separate areas of land that are used for different purposes." (Section 107, [2])

Further, Section 95 of The Planning Act, 1977 provides for the dedication of certain lands as Environmental Reserve at the time of subdivision. The Act additionally states that Environmental Reserve may be used as a public park or, otherwise, left in its natural state (Section 107[1]).

A number of policies relevant to the provision and use of open space in the river and creek valleys are contained in the Calgary General Municipal Plan (1979). The long term objective of the Calgary River Valleys Plan is to create a comprehensive open space system along the city's watercourses in accordance with Policy PR.16 of the Calgary General Municipal Plan which states:

> "Acquire major open space and natural areas, as part of the development of a total park and recreation network, in association with the Provincial Government".

Associated with policies presented in the Plan are recommendations in the report "Policy and Systems Plan" (1981) by the Parks/Recreation Department regarding the entire river park system. The number of policy recommendations contained within both the above precludes their presentation in this summary report. For more specific information the reader is referred to the 'Development of Policies', Sections B1.1.2.2 and B1.1.2.4.

Additionally, the Calgary Bow River Study Committee Report (amended and approved by City Council in June 1974) recommended that "the City place a high priority on implementing its proposal for developing the river valleys as an open space system" with particular emphasis on the currently vacant lands adjacent to the river for that purpose.

B1.1.1.3 Public Concerns:

The concept of an open space system in the river/creek valleys was emphatically endorsed by the general public. Citizens expressed a desire for and enjoyment of parks and open space, agreeing that considerable potential for the development of land for these uses existed at waterside locations. According to the questionnaires distributed at the Open Houses, the most preferred use for lands adjacent to the watercourses was "parkland with some developed recreational areas and some undeveloped natural setting areas". "Totally undeveloped park retaining its natural settings" and "single-family residential" were the second and third most popular land uses respectively (Appendix XVI). The principle of establishing a buffer of open space, except in existing riverside residential developments, was also supported. Particular emphasis was given to the significance of preplanning for the acquisition of open space, especially in newly developing areas, to minimize future potential conflicts and costs.

While the overall concensus was that open space in the river/creek valleys catering to recreational activities would be very popular and beneficial, some riverside residents were opposed to the concept of a continuous open space system. These residents voiced concern over the effects this open space system would have on presently developed riverside properties and the potential for an increase in socially unacceptable behaviour. Since the rivers/creeks are public resources, general public access should be provided where possible. The Calgary River Valleys Plan is a long term plan and to implement the

comprehensive open space system in an equitable and consistent manner, the Plan policies should be applied throughout the entire Plan area. However, the present discontinuous open space system in the river/creek valleys adjacent to older residential communities may be acceptable at this stage, but the long term objective of the Plan is to create, on an opportunity basis, a comprehensive open space system applicable to all the watercourses.

B1.1.1.4 Discussion:

The concept of linear park systems adjacent to waterways is not new. Parklands along the river Seine in Paris, the river Neckar in Stuttgart, and the North Saskatchewan River in Edmonton are all fine examples. Many advantages accrue to linear park systems in comparison with localized nodes of recreational activities. The potential for a variety of parks and trails within a system is substantial. Recreationists experience the freedom to jog, cycle and cross-country ski between recreation nodes catering to diverse needs without having to subject themselves to the hazards of crossing transportation corridors. The greater flexibility and recreational choice enjoyed by the public is further enhanced by linear and interconnecting trail loops throughout the system. In addition, it should be noted that areas characterized by urban blight may be landscaped and renewed as open spaces, thus improving the quality of life of the local people. Specific references to the economic, cultural, and recreational values of reclaiming abandoned or derelict waterside areas for various cities are contained in the 'Development of Policies', Section B1.1.4.3.

The provision of public open space in waterside locations caters to both the recreational needs and desires of the people. The attraction of water for recreational purposes is universal and not substitutable. It has been estimated that 25% of all recreation in the United States depends directly on the use of water resources (Collins and Tanner, 1976, P. 31), with an appreciably higher percentage of 60% estimated for semi-arid states (Lavery, 1974). A far greater portion of all recreational activity is enhanced by the presence of water. Water resources suitable for recreation purposes are scarce in Alberta; the province, in fact, possesses only 2.2% of Canada's lakes and rivers in terms of surface area. In Calgary and the southern half of the province, the potential for water-oriented recreational activities is further reduced by restricted public access, either due to private ownership of lands abutting the rivers and lakes or due to physical travelling distance (refer to 'Development of Policies', Section B1.1.5.1), as well as a lack of facilities providing for more intensive uses.

Because opportunities for water-oriented recreational pursuits are limited within the Calgary region, Calgarians must look towards their own resources for the provision of a diverse and exciting range of recreational opportunities. Calgary is fortunate in having considerable resources in the river/creek valleys suitable for open space recreational uses. While the Glenmore Reservoir provides many opportunities for water-based recreational activities, the greatest focus for water-oriented recreational use remains the rivers, particularly the Bow River. In fact, the vast majority of

the city's major regional parks are located in the valleys adjacent to the rivers and creeks. Thus, a number of the components of a comprehensive open space system are already in place. With the exception of residential communities in the extreme northeast and eastern parts of the city, almost all residential areas are in close proximity to the watercourses.

It has been noted that more than 75% of Canadian leisure time is spent within city boundaries (Collins and Tanner, 1976, p. 31). Since more than 80% of the Alberta population is urban based ("Alberta Land Use Forum 1976"), the need for urban waterside public regional open space is clearly evident and growing rapidly.

Notwithstanding the public need for regional open space throughout the city, the desirability of open space in waterside locations is considerable. The generally low intensity land uses in riverside open spaces reduce flooding hazards and potential damages, inhibit costly construction projects in swampy areas, enhance the growth of natural vegetation which in turn reduces the perception of crowding, enhance the value of adjacent properties, and preserve the natural character of the riverine lands.

The provision of public open space adjacent to the rivers/creeks, in lieu of continuous high intensity development, will inevitably contribute to the beautification of the rivers/creeks and abutting lands and ensure that the water quality remains high. Thus, people will perceive the rivers/creeks and riverside open spaces as safe, clean, and attractive places in which to recreate. The latter is particularly important in light of the considerable attention given to pollution in the Bow River and Nose Creek and the fact that a reversal of public perceptions is a lengthy process. At a time when Calgary is experiencing dramatic growth, the importance of regional open space along Calgary's rivers/creeks for recreational pursuits cannot be overstated.

B1.1.1.4.1 Cost/Benefit Implications of Regional Open Space Recreational Uses in the River/Creek Valleys

With respect to the cost/benefit measurement of the proposed regional open space recreational areas, it must be noted that at this stage, it is not possible to actually measure recreational benefits in terms of man hours that would be spent in enjoying the regional open space in the river/creek valleys. Such a cost/benefit analysis can perhaps be prepared for site specific recreational projects to be undertaken by the Parks/ Recreation Department. Generally cost/benefit analyses are effective only for specific projects. Moreover, many environmental and social costs and benefits are not quantifiable in acceptable terms.

However, for the purpose of this study, the following information will outline some major cost implications in developing the regional open space immediately adjacent to the watercourses for land uses other than open space recreational uses. It should be noted that most of the proposed regional parks and environmentally significant areas are located either in the flood prone areas or along the existing escarpments adjacent to the city's watercourses.

B1.1.1.4.1.1 Major Cost Implications:

Servicing Difficulties and Costs:

An analysis by Lombard North Group in 1975 of a suburban residential development northeast of Winnipeg indicated severe difficulties with sanitary sewer system failures, groundwater pollution, poor drainage, and high servicing costs e.g. electrical, telephone services, water, sewer and fire insurance costs were up to $500/lot/year higher than in Winnipeg, Manitoba.

Development on Slopes:

Large scale earthmoving will be involved; cuts and fills will cause major transformation of the landscape of the river/creek valleys and the distinctive features will be destroyed. Consequences of development on hill slopes can be illustrated by the following example:

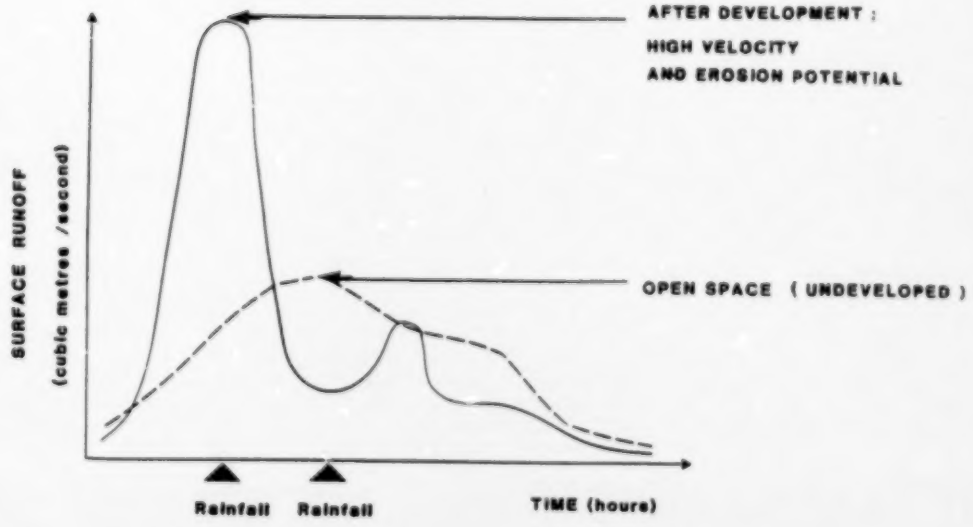
> Construction and earthmoving on the hill slopes surrounding Los Angeles, California have resulted in landslides, mudflows and property damages totalling millions of dollars in 1979.

Storm Water:

This is a major environmental component which all development must take into consideration. Water is the medium by which liquid wastes are conveyed away from buildings, and water supply is necessary for the proper functioning of human activities within a controlled environment.

Effects of Development Compared to Open Space Uses:

Under natural conditions prior to development, on the average 10% of the total amount of precipitation runs off overland, 40% evaporates, and about 50% infiltrates into the ground (excluding winter or early spring). These figures would be comparatively unfavourable in terms of high velocity and erosion potential in the case of developed areas, as illustrated in Figure 1 below.



TYPICAL HYDROGRAPHS

Figure 1

Hydrological Effects

- Increased velocity and peaking of runoff.
- Lowering of groundwater reserves and therefore adverse impact on existing flora and fauna.
- Increased probability of flooding and erosion because of large quantities of surface runoff with high velocity and peaking.
- Increase in siltation of watercourses, and water pollution.
- Silting up of river/creek beds will reduce their capacity to carry a flood particularly at a time when floods are of a high magnitude. This will result in an enlargement of the flood hazard areas (floodway and floodplain) and more extensive flood damages.
- Increase in flood volumes coincides with a decrease in dry weather flows because of reduced infiltrations where the land is covered with buildings and pavement.
- Increased effluent disposal into watercourses coincides with a reduction in their capacity to carry effluent during dry weather flows.
- Increased pollution of receiving watercourses due to debris and pollutants from streets and paved areas.
- Increased danger or damage from flooding.

B1.1.1.4.1.2 Major Benefits:

Opportunities for Stormwater Management:

- Open space uses provide opportunities for on-site retention and absorption of stormwater.
- Favourable economical balance can be achieved among the factors of capital, operating and maintenance costs, convenience, environmental protection, water-based recreation potential, and damage.

Effects of Natural Drainage in Areas of Nature Conservation Significance:

Improved ecological impacts in contrast with conventional methods as follows:

- Reduced peak flows and discharge velocity.
- Maintenance of groundwater level with potential recharge from inflitration.
- Enhanced water quality as a result of filtration action of the soil to remove pollutants.
- Reduced flood hazard.

Very often environmentally sensitive areas such as watercourses, marshlands, natural areas, hillsides and shorelines are difficult or costly to develop. But it is generally not realized that these areas also serve important functions such as the removal of pollutants or moderation of floods which are very costly to provide if natural functions are interrupted.

The equilibrium of steep escarpment slopes can be easily upset by construction, resulting in property damage and losses from soil erosion and land slippage. Hillsides such as the foothills around Calgary often constitute one of a city's scenic resources, which can be destroyed by indiscriminate development.

In view of the foregoing, it can reasonably be concluded that costs for the protection and maintenance of the city's natural areas and regional parks immediately adjacent to the watercourses can be outweighed by major benefits such as flood damage reduction, substantially reduced servicing costs, and the potential educational, recreational and touristic values of the resources themselves.

B1.1.1.5 Open Space Systems - Alternatives:

On the basis of the previously defined 'open space system', three distinct possible spatial forms of parkland have been identified. These are presented schematically in Figure 2.

(i) The Comprehensive Open Space System: This is characterized by a continuous strip of public land bordering both riverbanks. It may be regarded as the ultimate expression of the open space system. It permits the greatest possible range of options and has the greatest potential for accommodating recreational use. There is an effectively unlimited potential for the creation of looped trails to facilitate the greatest and most convenient movement of recreationists between all parts of the system. Other land uses can be integrated with public riverside land.

(ii) The Continuous Open Space System: The major units of the open space system are contiguous. Recreationists can move freely from any part of the system to another and access is available to at least one riverbank at any one point of the system. The potential for the creation of looped trails is more limited as compared to the Comprehensive Open Space System. Other land uses abut the watercourses in certain locations.

(iii) The Discontinuous Open Space System: This is the least satisfactory alternative from the perspective of optimizing the public recreational potential of the waterways. Some of the major open space components are contiguous whilst others are not. There is a marked tendency towards fragmentation of the system with considerable juxtapositioning of other urban land uses abutting the watercourses.

B1.1.1.6 Existing Open Space Systems:

The present open space system in Calgary's river/creek valleys varies from non-existent to comprehensive and is reviewed briefly as follows; further detailed information is contained in the 'Development of Policies', Section B1.1.6.4. From Bowness Park through Bowmont Park to Shouldice Athletic Park there are a number of minor breaks in the system due to the presence of major transportation routes, and private lands abutting the river. Downstream from Edworthy Park to Cushing Bridge (17 Avenue S.E.) the system is comprehensive with several major park nodes such as the Lowery Gardens, Prince's Island, and William Pearce Estate. Most of the land, however, is linear parkland with minor breaks at a number of locations. Downstream from the Cushing Bridge the system becomes discontinuous and fragmented reflecting the presently low intensity of development in much of this area.

OPEN SPACE SYSTEMS - ALTERNATIVES

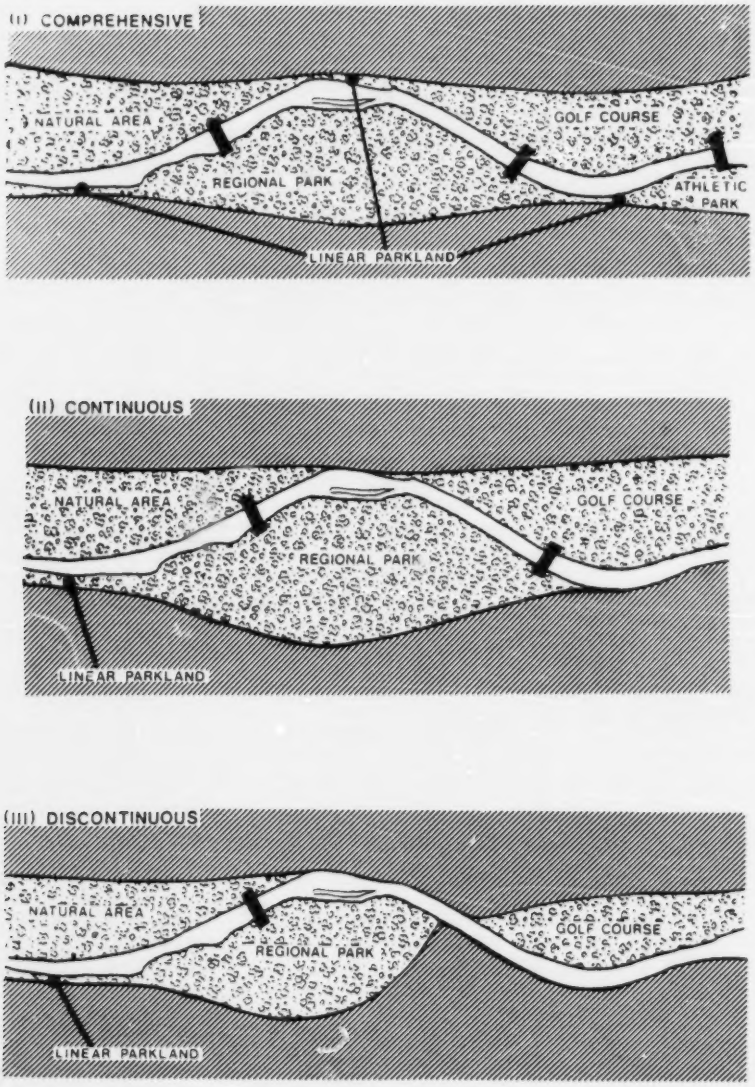


Figure 2

Downstream of the Glenmore Dam, the Elbow River is favoured with a continuous open space system to the westerly end of Riverdale Avenue, at which point it becomes discontinuous. As well as major park nodes, linear parkland abuts the river in many locations.

Insofar as Nose Creek and West Nose Creek are concerned, a discontinuous open space system exists adjacent to Nose Creek south of 80 Avenue. No system exists north of 80 Avenue adjacent to either creek because most of the area is presently undeveloped.

B1.1.1.7 Conclusion:

The ultimate goal of the Calgary River Valleys Plan is the creation of a comprehensive open space system in the river/creek valleys. It is believed such a system will permit a productive use of scarce and invaluable recreational resources for the greatest public benefit. The identification of problems and opportunities involved in achieving the overall plan objectives are stated in the 'Development of Policies', Chapter A2. The creation of such a system is a long term proposition, although the major components of the system can probably be in place within a decade. Final implementation is contingent upon further study and public input with particular reference to the riparian rights of private residential land owners regarding certain linear connections in the system as discussed in Section B1.1.2. The Plan recommends implementation only of those parts of the system which are desirable, practical, equitable, and realistic.

The comprehensive open space system would accommodate the increasing public demand for parkland as leisure time of the city's rapidly growing population increases and especially as new communities become established in close proximity to Calgary's watercourses. Additionally, such a system would provide a variety of parklands and facilities catering to both individual and organized recreational activities and the increasingly popular space consumptive pursuits such as jogging, cycling, and cross-country skiing.

The provision of diverse, mutually complementary parkland open spaces would minimize use conflicts, satisfy various recreational demands, and disperse the intensive demand on scarce resources, thereby ensuring rewarding and satisfying experiences for all recreationists and the protection of notable areas of the natural environment. By accommodating the requirements of the people, the Plan is sensitive to the public and, therefore, the potential for park obsolescence is greatly reduced.

The major regional open space units which form part of the regional open space system are discussed in Section B1.1.7 of the 'Development of Policies'. Acquisition of land for regional open space may be both active and passive. These respective high and low priorities are discussed below.

<u>High Priority - Active Program of Acquisition</u>:

Necessary funds would be set aside by City Council for a project to be undertaken within a given time frame. This would lead to an active approach involving negotiations between land owners and the City of Calgary Land Department to facilitate acquisition of land within the time frame established by City Council.

Low Priority - A Policy to Protect Land for Future Public Purposes:

The effect of this policy made by City Council with respect to land means that the property would be acquired if offered for sale at a suitable price, and providing sufficient funds in a general acquisition budget were available. Negotiation would be undertaken with the land owners and a proposal to acquire land would be made through the Land Committee to City Council.

Land acquisition sites for regional open space are itemized in Table 3 in the Implementation Chapter of 'The Plan and Policies'.

B1.1.2 PUBLIC ACCESS

B1.1.2.1 Calgary's rivers and creeks provide opportunities for diversified recreational experiences. However, the preservation of creek/riverbank parkland and natural areas is not, in itself, sufficient to engender a full appreciation of the city's natural assets by the urban populace. This is only possible with the provision of adequate public access to and along these rivers and creeks.

In accordance with the objectives of this plan, the establishment of continuous riverbank walkways/pathways as a part of a comprehensive open space system along the Bow and Elbow Rivers and their tributaries will facilitate the optimum utilization of recreational facilities and open space, and will increase public awareness and appreciation of Calgary's river and creek valleys as viable, natural recreation resources. Public access to and along the rivers and creeks will also increase public appreciation of the total variety of regional open space experiences and will promote awareness of the river system within the urban environment.

B1.1.2.2 Existing Policies:

The present public walkway/pathway systems along the Bow and Elbow Rivers were developed in accordance with existing policies of City Council. The Calgary General Municipal Plan is a long term policy intended to serve as a general guideline for future development adjacent to the city's watercourses. Long term policies embodied in the General Plan are based on sound planning principles and these policies should be implemented when it is feasible to do so. A directive for the development of a riverbank walkway/pathway system is contained in Policy PR.13 of the Calgary General Municipal Plan (1979).

> "PR.13 Develop the river valleys as a parkland system which includes:
>
> i) continuous public access to all riverbanks...."

Although there is no time limit imposed on the implementation of the above policy, it is important to clarify the process for implementing the policy. It is therefore recommended that Subsection i) of Policy PR.13 be appropriately amended to reflect its long term objective and its implementation based on suitable opportunities.

In addition, the Parks/Recreation Department in its "Policy and Systems Plan" (1981) has included the acquisition of land for the provision of continuous public access along the city's watercourses as a long range objective.

B1.1.2.3 Public Concerns:

In meetings with communities, a number of concerns relating to public riverbank walkways/pathways affecting private residential properties were voiced. Some mention was made regarding the expropriation of privately owned lands for the construction of walkways/pathways and development of public parks. Citizens do not want to lose land to a walkway/pathway system which threatens their way of life. With respect to the provision of a buffer of land along the banks of the watercourses where private properties abut the rivers edge, 50% of questionnaire respondents stated that "all privately owned property should remain private" while 26% of respondents felt "the City should buy sufficient property adjacent to the river to provide walkways and access to the river, leaving remaining property to the present owners" (Appendix XIII). In view of this, it should be noted that, at present, there is no policy which allows for an active land acquisition program in terms of riverbank walkways/pathways; nor has any land been expropriated for this purpose. The public also felt that City planners were not receptive to public concerns.

However, the prime concern was the ability of law enforcement personnel to maintain the security, protection, and privacy of riverside residential neighbourhoods with particular emphasis on anticipated higher incidences of vandalism, littering, and other socially unacceptable behaviour which citizens perceived would arise from increased public access and consequently result in the devaluation of properties in riverside communities. As a result of these public concerns, the City Planning Department contacted the City of Saskatoon, Saskatchewan, Baltimore in Maryland, Denver in Colorado, and Houston in Texas, U.S.A. concerning walkway closures which might have been implemented due to public concerns. In these cases, the respective Planning, and Parks and Recreation Departments advised that they had no information on record respecting closures of any of their existing riverbank walkways/pathways.

On October 18, 1979 a special meeting of the Calgary River Management Advisory Committee was convened to allow representatives from the communities of Bowness, Rideau/Roxboro, Elbow Park and Riverdale to express their concerns directly to the Advisory Committee.

In response to a brief submitted by the Rideau/Roxboro and Elbow Park Community Associations detailing these concerns, entitled "The Riverbank Problem - Security, Protection and Privacy for Riverside Residential Neighbourhoods," the Operations and Development Committee on December 3, 1979 adopted the following recommendation with amendments:

"That the subject Brief be referred to the Administration with instructions to consider these concerns in preparation of the Calgary River Valleys Plan."

Amendments:

1. "That it be clearly understood that as the Calgary River Valleys Plan relates to privately-owned residential property, that Council is given no acquisition directive at this time. Further, that Council will expect the plan to examine every

possible alternative to acquisition of residential property before recommending any action towards acquiring lands presently in private ownership.

2. That the Calgary River Valleys Plan outline a program for maintenance and safety control along the pathway systems.

3. That the report from the community be referred to the Police Department for comment regarding the allegations to safety and crime and that the Police Department's comments be brought back to the Standing Policy Committee on Operations and Development."

In accordance with Amendment #3 concerning the allegations to safety and crime resulting from the existing walkways/ pathways along the riverbanks, the following report (City Police Department) and recommendations (Commissioners' Report) were provided to the Operations and Development Committee.

"Riverbanks and parks, particularly in secluded areas, represent special policing problems. The absence of vehicular access makes the job even more difficult because continuous foot patrols of the many miles of riverbanks and parks is simply not practical; and the volume of activity taking place in other parts of the city demands a higher priority in the deployment of police manpower.

Those parks and riverbanks with vehicular access, i.e., Lindsay Park, Stanley Park, Sandy Beach Park, and Glenmore Park, all receive regular routine patrols, while the others are often attended only to investigate specific complaints.

Parks and riverbanks attract their share of undesirables such as sexual deviants and noisy groups of partiers, but many such offences are occurring everywhere else as well. They are not unique to parks and riverbanks.

There are no easy solutions to the parks and riverbanks security problems, but certain measures have been adopted in an effort to curtail them. Numerous liquor and drug offences have been prosecuted as a result of random checks within parks and at entrances and exits. Motorized trail bikes and bicycles are being utilized in areas inaccessible by car. The Mounted Patrol has been formed and is now operational. Zone and District Commanders are meeting with community representatives to discuss mutual problems.

Recommendation:

That the Operations and Development Committee recommend:

1. That Council request the Police Department to meet with the Calgary River Management Advisory Committee to examine this issue in greater detail.

2. That Council instruct the Administration to consider the concerns detailed in the foregoing report in the preparation of the Calgary River Valleys Plan.

Action Recommended:

Approval of the above".

The above recommendations were adopted by the Operations and Development Committee on February 4, 1980 and subsequently adopted by City Council on February 18 and 19, 1980 with the following amendment:

"That Recommendation No. 2 contained in Clause OD80-10 of the Report of the Standing Policy Committee on Operations and Development be amended by addition of the following:

". . . with particular attention being paid to the location of homes and patio areas as they will relate to public pathways in terms of privacy loss, desirability of fences, etc., to protect against trespassing, window peeping and vandalism, and the legal implications of property rights contained in titles to property."

Less frequently expressed concerns by the general public included the lack of continuity in the existing riverbank walkway/pathway system, inadequate maintenance and safety measures taken along the walkways/pathways, and adverse environmental damage to adjacent land attributed to both the construction and use of the walkways/pathways (refer to 'Development of Policies', Section B1.2.2.2).

B1.1.2.4 While the concensus was that more riverside park space is needed and that private ownership of riverbank land was not appropriate, citizens viewed public access through private lots as extremely undesirable. Insofar as public access and/or easements to and along the rivers and adjacent private properties are concerned, the status of riparian rights must be considered.

At the request of the City Commissioners, the status of riparian rights was presented to City Council in a report by the City Solicitor on January 24, 1980.

> "The term 'riparian rights' may be generally defined as the rights of every person through whose land a natural watercourse runs to the benefit of the stream or river as it passes through his land for all useful purposes to which it may be applied. The concept of riparian rights originated in Roman law and was brought into the English common law system by them... The common law concept has been extensively modified, if not completely changed, so that it now seems that riparian rights refer only to use of the water and do not include ownership of the river bed." (refer to Section 4 of The Public Lands Act of Alberta)

The City must obtain permission of the owner for any part of the walkway/pathway system which would cross his land. At the same time, in accordance with the riparian rights of the land owner, "the pathway must not interfere with his enjoyment and use of the water".

B1.1.2.5 The majority of existing private residential properties extend to the water's edge and most are fenced to the edges of the rivers but not along the rivers. The predominantly natural vegetation in the rear yards is generally well maintained. In certain cases along the Bow and Elbow Rivers, land has been added to private properties either by accretion or recession of the water and

> "the new land thus formed belongs to the riparian owner in front of whose land it is formed .... The converse is also true, that lands gradually encroached upon by the water upon which they border cease to the extent of the encroachment to belong to the former owner"

and revert to the Crown (refer to Appendix III, "Natural Boundaries").

Where walkways/pathways are constructed on private residential lots with the permission of the owner, it is necessary to ensure the privacy of the residents while simultaneously respecting the riparian rights of the owners. These two objectives would seem to be in conflict. Wooden fences separating the riverbank walkway/pathway from existing private residential properties would ensure privacy at the expense of an overall view of the river. Conversely, 'chain link' fences permit views and encourage awareness of adjacent waterways but do not completely address the aspect of privacy. (For more detailed discussion refer to Section B1.2.3.1 of the 'Development of Policies'.)

With respect to the foregoing, it should be noted that on two private residential properties, located east of the Elbow River between 24 Avenue S.W. and 25 Avenue S.W., the City has a public walkway/pathway as a result of an agreement between the land owners and the City. A 'chain link' fence was erected and no complaints have been received from the adjacent residents.

B1.1.2.6 Existing Walkway/Pathway Systems:

The existing walkway/pathway systems along the Bow and Elbow Rivers include sidewalks on vehicular roads, easements and separate public rights-of-way for pedestrians and cyclists. Easements for public access along the Bow River have been obtained through some residential properties in Bowness as a result of subdivision/development on these private properties. Since no walkways/pathways were actually developed, no access is available at these locations along the riverbank. However, public access to the Bow River adjacent to Bowness is adequate at this stage.

The Bow River system currently consists of 26 miles/42 km of constructed walkways/pathways within 56 miles/90 km of the total river frontage. It is emphasized that the excellent potential afforded by the Bow River for recreational pursuits at a regional scale throughout the year warrants continuous public access to be fully realized. In consideration of this, the areas of high priority construction include pedestrian walkway/pathway links as itemized in Table 1 in the Implementation Chapter of 'The Plan and Policies'. The implementation of the above proposal will create a continuous riverbank walkway/pathway system (not necessarily along both banks) along the Bow River from Bowness Park to Fish Creek Provincial Park without affecting existing residential properties adjacent to the river and will facilitate greater public recreational opportunities along the river. Extensions to the walkway/pathway system in the southeast are given low priority and have already been included in the Area Structure Plans for implementation in the Riverbend and McKenzie areas approved by City Council on October 23, 1979.

There are approximately 6 miles/9.5 km of constructed public walkways/pathways along the Elbow River within 14 miles/22.4 km of the total river frontage. Because of its smaller size and location in highly developed areas, recreational opportunities along the Elbow River have a more local appeal than those of the Bow River. In view of this, public access to and along the Elbow River is currently adequate adjacent to the existing private residential development. It must be emphasized, however, that future public access to or along the riverbank will be dependent upon changes in the land use which might occur.

Currently, no walkway/pathway link exists between the terminal point of the present riverbank walkway/pathway system located within Glenmore Athletic Park and Glenmore Park. In order to maximize the use of these public parks, provision for a walkway/pathway link must be made on a high priority basis and it will involve only City-owned land.

In relation to a policy of the Parks/Recreation Department regarding the provision of trail loops, thereby ensuring optimum use of public open space and flexibility in recreating opportunities, three locations along the Elbow River have been identified where trail loops will be needed in the future on a low priority basis. These include the riverbank abutting the Calgary Golf and Country Club golf course, the Roman Catholic Cemetery riverbank land, and the Stampede Grounds riverbank. The construction of walkways/pathways at these locations would permit greater use of public open space and eliminate the current average detour of half a mile from the river.

With reference to Nose and West Nose Creeks, all walkway/pathway proposals, north of 80 Avenue N.E., are given low priority and may be implemented as and when subdivision of adjacent lands in excess of 2 acres (0.8 ha) occurs, or through City negotiations for the acquisition of land required for the implementation of the walkways/pathways.

While most of the bridges over the Bow and Elbow Rivers and Nose Creek serve vehicular traffic, some are designed for rail and pedestrian traffic.

Certain bridges have insufficient vertical clearance and are located so closely to the river's edge that little or no space is left for landscaping or public walkways/pathways under these bridges. Consequently, pedestrians must cross heavily travelled major roadways and the continuity in the existing riverbank walkway/pathway system is disrupted. Further, due to a lack of pedestrian sidewalks on some bridges a 'loop system' in the overall riverbank walkway/pathway network cannot be achieved.

Pedestrian access is essential both over and under bridges to maintain the continuity of the riverbank walkway/pathway system as a part of a comprehensive open space system. Such bridges should be adequately designed with respect to stability during a major flood and should be aesthetically compatible with the riverine environment in an urban setting.

B1.1.2.7 Alternatives for Securing Public Access:

To ensure that the general public accrue maximum benefit from the year round recreational facilities and recreational opportunities offered by Calgary's rivers/creeks, it is necessary that people perceive the

watercourses as viable recreation resources. Public access is, therefore, of vital importance. Possible opportunities for securing public access to the city's watercourses are reviewed as follows.

With reference to subdivision, The Planning Act, 1977 (Sections 94, 95 and 96) states that the owner of land containing more than 2 acres (0.8 ha) subject to proposed subdivision must dedicate land required to be provided as Environmental Reserve and 10% of the remaining area in a proposed subdivision as municipal and/or school reserve. The current provision for a strip of land as Environmental Reserve not less than 20 ft./6 m in width abutting a watercourse is, however, insufficient to ensure proper and safe public access to the rivers/creeks since many existing creek/riverbanks are steep or unstable. Therefore, in some cases, land more than 20 ft./6 m in width will be necessary to accommodate safe public access and may have to be acquired by the City of Calgary.

All or part of the required municipal reserve could be located adjacent to the rivers/creeks for public access or money accepted into a fund in lieu of such reserve to be used to acquire lands, on an opportunity basis, for public access. Alternatively, reserves could be deferred against future subdivision of creek/riverbank land belonging to the same land owner(s) owning land that is the subject of a proposed subdivision occurring away from the rivers/creeks. In this case, however, subdivision of the land may not coincide with the time when public access along the creek/riverbank is needed.

Currently, under The Planning Act, 1977, land can be secured for walkway/pathway purposes as part of the 30% dedication for roadways in large scale subdivisions. The feasibility of applying this practice in small scale subdivisions should be investigated by the City Planning Department in the near future.

City Council can establish minimum building setbacks for development, thereby protecting a strip of land adjacent to the waterways and thus rendering subsequent acquisition of the creek/riverbank land or easements for public access easier to negotiate as and when redesignation of land abutting the rivers/creeks occurs. Building setbacks are recommended in relation to the Floodplain Management Policy in Section C1.2.1.3. of 'The Plan and Policies.'

Insofar as the development of land is concerned, the building setback requirements can be incorporated into the Land Use By-law and applied to permitted as well as discretionary uses, thus providing a consistent approach applicable to all creek/riverbank land.

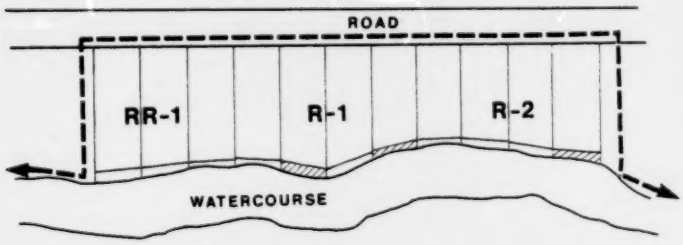
In accordance with The Planning Act, 1977, City Council can establish policies requiring public walkways/pathways along the city's rivers/creeks as well as building setbacks from the rivers to preserve land for this purpose. There are a number of Statutory Plans in which such policies and related implementation procedures can be included. Among these are the Calgary General Municipal Plan, Area Structure Plans and Area Redevelopment Plans. The aforementioned Statutory Plans are binding on the Subdivision Approving Authority, the Development Appeal Board, and the Development Officer and are thus sure to be complied with. However, it should be noted that land for public access, in some cases, may have to be acquired by the City of Calgary.

Therefore, wherever feasible, public access to and along Calgary's rivers and creeks should be created, thus enhancing public awareness of the river system as a whole as well as the potential recreational opportunities within the river and creek valleys.

However, in the case of lots abutting the watercourses which are currently designated RR1, R1 or R2-Residential Districts, and presently unaffected by riverbank walkways/ pathways, future public access to the watercourses should be secured through negotiations with land owners.

It is further emphasized that extension of the public access rights-of-way or easements beyond those which exist at the time of approval of the Calgary River Valleys Plan should be achieved by negotiation with land owners as opportunities arise; or as specifically directed by City Council. (Refer to Policy C1.1.3i) (a) and (b) of 'The Plan and Policies')

The above situation is illustrated below:



Existing public access right-of-way (walkway/pathway actually constructed)

Existing public access easement obtained by negotiation with land owners (walkway/ pathway not actually constructed)

Residential lots abutting the watercourses currently unaffected by public access to the watercourses.

B1.1.3 NATURAL AREAS

B1.1.3.1 The protection and preservation of existing natural areas within Calgary is a major component of the comprehensive open space system along the city's rivers and creeks. For the benefit of all citizens, it is desirable that the 'naturalness' of these areas be maintained while simultaneously realizing potential opportunities for recreational activities wherever possible.

In the context of this report, natural areas have been identified as open 'green space' predominantly covered with indigenous vegetation such as prairie grassland or riverine forest, with indigenous fauna present, and lacking substantial modification by man which includes active arable or other farmland uses.

The Calgary river/creek valleys have experienced a brief period of settlement. As a result, there still remain a number of natural areas within the current city limits. However, in light of the rapid growth experienced in the city during recent years, it is vital that current policies relating to the protection and preservation of natural areas be actively pursued for the benefit of the people.

B1.1.3.2 The primary concern in terms of natural areas is the resolution between an increasing need for recreational facilities and open space, arising from a rapidly growing urban population, and the need to protect and preserve the nature conservation significance of natural areas. It is the basic premise of this plan that the preservation of natural areas, thereby safeguarding existing species, communities, and habitat, takes precedence over the development of natural areas for recreational uses should a conflict between these two objectives arise. This, however, should not exclude the development of suitable recreational uses where needed.

The expectation that an urban open space system could accommodate all recreational demands is probably unrealistic. The immediate problem concerning Calgary's natural areas is one of reducing and controlling adverse recreational impacts. This is particularly important with reference to Major Natural Areas where the high degree of 'naturalness' which makes them attractive for recreational uses, also renders their respective ecosystems more susceptible to ecological damage as a result of human activities. The dual aims of ensuring preservation and providing for recreational use are inevitably in conflict. The types of management policies in existence and the manner of implementation will determine the potential success in the realization of these aims.

B1.1.3.3 Review of Existing Policies:

Currently, there are a number of policies and statutes relating to the protection of natural areas. The Planning Act, 1977 has made provision for the dedication of land as Environmental Reserve at the time of subdivision stating that:

> "Environmental reserve may be used as a public park but if it is not so used, it must be left in its natural state." (Section 107 [1])

Additionally, "Environmental Reserve may not be sold, leased or otherwise disposed of". (Section 115)

In 1974, City Council approved the report "Policy Concerning Flood Plain Management and the Acquisition of Riverbank Property" recommending that:

> "A variety of park settings ranging from Natural Areas to manicured urban parks, be established along the Bow River." (Incompatible Riverbank Uses No. 6, p.6)

Similarly, both the Calgary General Municipal Plan (1979) and the Parks/Recreation Department's "Policy Statement and Planning Recommendations" (1976) emphasized the retention of natural areas as a priority component of an open space river valley system with the latter recommending that:

> "All natural areas that remain in the river valleys, Weaselhead Natural Area, Nose Hill Escarpments and Beddington Creek Escarpment be preserved." (p. 38)

B1.1.3.4 Public Concerns:

Throughout the public input process it became evident that the preservation of natural areas was the prime concern of the general public. An overwhelming 94% of questionnaire respondents wanted "secluded quiet natural areas" on lands adjacent to the rivers/creeks while 83% supported

"wildlife preservation areas" (Appendix XIII). Concern was expressed that environmentally sensitive areas were inadequately protected against the pressures of an expanding urban infrastructure and increasing recreational use of open space. The preservation of natural areas was deemed highly desirable to permit the unhindered functioning of various ecosystems, for recreational uses, and as effective escape valves for pressures created by urban lifestyles.

B1.1.3.5 While recreational potential is the most frequently cited benefit of natural areas, it should not be considered to the exclusion of all other benefits. The presence of natural areas within the urban form provide ideal outdoor laboratories for educational purposes, enhance the neighbouring properties, provide stability to adjacent communities, perform ecological work such as replenishing the air with oxygen, act as buffers against noise pollution, and are aesthetically valuable.

In contrast, a number of less beneficial aspects may be attributed to natural areas within urban space. The transmission of wildlife diseases to the general public may be perceived as a threat to health although, in fact, the possibility of widespread distribution through the public is negligible. Additionally, natural hazards such as swiftly flowing water or slipping escarpment tops are potentially dangerous. Further, natural areas require maintenance and management expenditures and their presence may restrict urbanization in a particular direction from the city. Indeed, natural areas may not be fully utilized unless they are perceived by the public as providing enjoyable recreating opportunities.

Natural areas include numerous small, fragmented, discontinuous areas as well as Major Natural Areas. The Major Natural Areas are the large remnants of natural environments which have, to date, survived the process of urban growth. They are unique and irreplaceable. These natural areas are distinctive areas in an urban environment and they have the potential to provide a specific type of recreational experience at the regional level which is not substitutable. Therefore, their continued existence is desirable and necessary.

B1.1.3.6 Evaluatory Criteria:

In this study, Major Natural Areas were evaluated on the basis of three classifications of criteria, biological, value-based and constraining criteria, as derived principally from the Nature Conservation Review, Vol. 1, 1977. The biological category permitted the evaluation of natural areas according to their nature conservation significance; value-based criteria measured human preference and perceived desirability of natural areas; the constraining factors reflected the feasibility of both ensuring preservation and providing recreational uses in natural areas. The evaluatory criteria, subsumed under their respective categories, are itemized below.

Biological

a) size
b) diversity
c) naturalness
d) rarity
e) fragility
f) typicalness
g) seasonal value

Value-Based

a) recorded history
b) position in ecological/geographical unit
c) potential value
d) intrinsic appeal
e) presence of natural features

Constraining

a) developability and economic value
b) ownership
c) nature of surrounding land uses
d) probable intensity of use
e) accessibility

More detailed information is available in Section B1.3.7 of the 'Development of Policies'.

B1.1.3.7 Classification of Major Natural Areas:

On the basis of these evaluatory criteria, thirteen Major Natural Areas were identified on the Bow River, one on the Elbow River, and two on West Nose Creek as illustrated in Figure 1 in Section C1.1.4.11 of 'The Plan and Policies.'

All the Major Natural Areas identified are major environmental resource features of city-wide significance and should not be planned in isolation. They are the highest quality natural areas within the city. The preliminary classification of these natural areas provides an indication of the qualitative variety of natural areas within the city and provides the broad distinctions necessary for site planning, management and assessment of the potential for recreational use as well as for public information purposes. It is emphasized that these classes are tentative and subject to future revision as additional research information becomes available and/or when site conditions change.

Within each class, sites are numbered consecutively from the furthest upstream location and prefixed by the first letter of their respective river or creek name. In this manner, (B1) refers to the furthest upstream site on the Bow River.

CLASS 1: Calgary's finest natural areas in the river valleys. They rate very highly according to several of the evaluatory criteria identified. The criterion of large size was a prerequisite for inclusion in this class.

(B1) The riverine escarpment on the right bank of the Bow River extending west from approximately 89 Street N.W. and the 33 Avenue N.W. alignment.
(B5) Edworthy Park and abutting lands.
(B6) The Inglewood Bird Sanctuary.
(B9) The Cominco Natural Area.

CLASS 2: Outstanding sites of only slightly less significance than Class 1. They may be slightly smaller and duplicate some features of Class 1 sites.

(B3) The area commencing at approximately the 33 Avenue N.W. alignment - bound on the west, north and east by the west channel of the Bowness Lagoon and on the south by the riverine escarpment.
(B4) Bowmont Park.
(B8) An area of riverine flatlands and escarpment on the left bank of the Bow River abutting the C.N.R. railway line and Beaver Dam Flats Park.

(B10) Carburn Park.
(B13) An extensive area of riverine escarpment including some small areas of riverine flatlands located opposite the Fish Creek Provincial Park.
(WN1) The south-facing escarpment situated to the west of 4 Street N.W. and north of West Nose Creek.

CLASS 3: Sites of lesser importance from a nature conservation standpoint. They may be small or extensively disturbed but do contain areas of natural environment which may be equal in quality to the best examples contained in the other two classes.

(B2) An area of riverine flatlands on the left bank of the Bow River opposite the western extremity of Bowness Park.
(B7) An area of flatlands on the right bank of the Bow River immediately south of the Bonnybrook Bridges.
(B11) An area of riverine flatlands on the left bank of the Bow River located predominantly north of the private Canfarge Bridge at approximately the 108 Avenue S.W. alignment.
(B12) The riverine escarpment adjacent to the Queensland Downs development.
(E1) Elbow Island Park.
(WN2) West Nose Creek valley east of 4 Street N.W.

B1.1.3.8 Conclusion:

Natural areas within the city afford some of the best opportunities for a variety of recreational activities because they are diverse and distinct. Considering this, the qualitative variety of the natural areas and wildlife should be maintained to enable the urban population to accrue maximum benefits from diverse natural experiences. This natural diversity should be maintained, for without it all natural areas will become standardized and sterile, lacking any degree of distinction. The preservation of the greatest possible number of diverse, viable habitats, in addition to providing various recreational opportunities, should be encouraged for the aesthetic, educational, ecological and economic values as well.

Due to the aspect of land use economics within urban areas and the necessity of maintaining a viable city infrastructure, increasing pressure arises for the development of natural areas. To prevent the occurrence of any potentially damaging development, a proponent must adhere to conditions outlined in Section C1.1.4.8 of 'The Plan and Policies'.

However, this is not sufficient in itself to ensure the protection of natural areas. All Major Natural Areas are major environmental resource features of significance to residents of the city. Therefore, it is desirable to conduct detailed site studies and encourage monitoring, on an ongoing basis, to determine management options. All identified Major Natural Areas are analyzed individually in Section B1.3.11 of the 'Development of Policies'.

To ensure the continued viability of natural habitats and simultaneously facilitate the free movement of wildlife within natural areas and along the rivers/creeks, the adjacent land uses should be compatible with these Major Natural Areas. In view of the above, the provision of suitable buffers would be desirable. Land acquisition priorities are as indicated in Table 3 of the Implementation Chapter in 'The Plan and Policies'.

Further relevant guidelines for the management of natural areas are presented in "A Policy for Environmentally Sensitive Areas" (August 1979), a joint project by the Parks/ Recreation and Planning Departments. This report was approved by the Calgary Planning Commission in September, 1979.

Major Natural Areas and their associated ecosystems should be protected and preserved as distinctive features of the riverine environment whilst creating, wherever possible, enhanced recreational opportunities for the benefit of the people.

B1.2 FLOODPLAIN MANAGEMENT:

B1.2.1 DISCUSSION

B1.2.1.1 The objective of the floodplain management policies is to minimize loss of life, threat to health and to reduce economic loss by flooding.

Bearspaw Dam, constructed on the Bow River in 1954, is utilized for generating electricity and for controlling only short term flow fluctuations in the Bow River. According to the Montreal Engineering report, "City of Calgary Flood Study, Volume 1, Bow River Report", dated May 1973, significant summer flooding in Calgary will occur when flows in the Bow River (above the Elbow) are of the order of 20,000 to 25,000 cubic feet per second.

With the construction of Glenmore Dam on the Elbow River in 1932, the 1% probability flood of 28,000 cubic feet per second has been reduced to 20,300 cubic feet per second (refer to "Elbow River Flood Study", December 1979, by Monenco Consultants Limited for the Alberta Department of the Environment).

The potential for flooding is greatest during the June-July period when mountain runoff is at its peak and severe summer storms are most likely to occur. On the other hand, the risk of winter flooding has been reduced because of construction of Bearspaw Dam in 1954, reduction in monthly winter flows, dykes built through the central parts of the city and construction of the Ice Pack Anchorage in 1959 downstream of Louise Bridge. Although the aforementioned works have reduced the probability of a severe winter flood, a potential hazard remains as illustrated by the winter flood of 1966 when the dykes adjacent to Hillhurst/Sunnyside were topped by flood waters.

The City of Calgary experienced three major floods during the period 1879 - 1902 which were more severe than any since experienced. The flood of 1897 on the Bow River, with a peak flow of 80,000 cubic feet per second above the Elbow River and an estimated return period of once in 70 years, would have affected about 2,500 dwellings and 350 commercial and industrial establishments by overland flows in 1973.

Since that time there has been further development in the floodplain. At the end of August 1979, there were approximately 2,059 single-family houses, 553 multi-family buildings and 239 commercial and industrial establishments located in the floodplain of the Bow River. Most of the redevelopment and new development, excluding Bow Village, Point McKay, Deer Run developments, Eau Claire and the Federal Government office building, is not in accordance with the current floodplain management policy of City Council because it is not required to comply with the policy.

Based on 1973 values, Montreal Engineering estimated that damage from a flood of 80,000 cubic feet per second would be about $10 million. These estimates were based on the assumption of idealized flow conditions; the possible blockage of bridges or failure of stream banks were not considered. Taking into account new development and inflation factor, the damage estimate for 1980 would not be less than $50 million in the case of the Bow River.

According to the Monenco Consultants report, "Elbow River Flood Study", about 462 houses, 26 apartment buildings, and 3 other buildings would be affected in the event of a flood of 1% probability with a designated flow of 20,300 cubic feet per second downstream of Glenmore Dam. Additionally, 20 apartment buildings, 770 houses and about 34 other buildings outside the floodplain of the Elbow River would be affected by sewer backup, including the damages and destruction to utilities and bridge structures. Total potential damages are estimated at $13,470,000.00.

B1.2.1.2 An approximate breakdown of areas developed in the floodway and floodplain of the Bow and Elbow Rivers is shown in the following tables:

BOW RIVER

	Approximate Developed Area	Approximate Open Space Use (Private & Public)	Approximate Total Land
Floodway	0.95 acres (0.39 ha) 0.06%	1,584.05 acres (641.54 ha) 99.94%	1,585 acres (641.93 ha)
Floodplain	810.24 acres (328.15 ha) 21.94%	2,882.76 acres (1,167.52 ha) 78.06%	3,693 acres (1,495.14 ha)
Total Land Subject to Flooding	1,161 acres (470.21 ha) 22%	4,117 acres (1,667.39 ha) 78%	5,278 acres (2,136.84 ha)

Source: Montreal Engineering Company Limited, "City of Calgary Flood Study, Volume One, Bow River Report", May 1973.

ELBOW RIVER

	Approximate Developed Area	Approximate Open Space Use (Private & Public)	Approximate Total Land
Floodway	1.44 acres (0.58 ha) 1.55%	91.63 acres (37.11 ha) 98.45%	93.07 acres (37.69 ha)
Floodplain	92.98 acres (37.66 ha) 41.40%	131.62 acres (53.30 ha) 58.60%	224.60 acres (90.96 ha)
Total Land Subject to Flooding	136.44 acres (55.26 ha) 42.95%	181.23 acres (73.40 ha) 57.05%	317.67 acres (128.66 ha)

Source: Planning Department (based on Monenco Consultants Limited "Elbow River Flood Study", December 1979)

B1.2.1.2.1 The flood prone areas along the Bow River between Bowness Park and Inglewood Golf Course have been developed mainly for major public parks, vehicular traffic use, and residential and industrial development with some commercial development. In the southeast part of the

city, the main land uses in the floodplain include large undeveloped parcels, public parks, agricultural activities, gravel extraction, and the manufacturing of concrete products.

The floodplain of the Elbow River has been developed mainly for public parks, roadways, residential and industrial uses with minimal commercial uses. To date, there is no specific floodplain management policy for the Elbow River.

As the city has expanded, the danger of serious flood damage to life and property has increased, whilst the size of flood necessary to inflict such damage has dropped. An example of just a small flood will serve to illustrate the above point. Referring to June 18, 1933, the Montreal Engineering report, entitled "Floodplain of Bow River in the City of Calgary, Volume 1", (February 1968, page A-6) notes that "a minor flood of about 23,000 cfs on the Bow passed through the city without incident". Today a flood of this magnitude would cause damage to certain buildings erected in the floodplain because compliance with the current floodplain management policy guidelines is not required.

B1.2.1.3 Although the City of Calgary has a floodplain management policy with respect to the Bow River, the policy is neither comprehensive nor firm in terms of clarity and land use planning or development controls in the river valleys. The present policy was adopted by City Council on June 24, 1974. This policy evolved out of the following reports.

1. "Bowness Flood Study Report 1971", prepared by Montreal Engineering Co. Ltd.;

2. "City of Calgary Flood Study, Volume 1, Bow River Report", May 1973, prepared by Montreal Engineering Co. Ltd.;

3. "Report", dated January 1974, prepared by the Calgary Bow River Study Committee.

B1.2.1.4 Review of Current Floodplain Management Policy:

"a. That flood plain management guidelines be provided to all developers proposing construction within the flood plain as an advisory measure.

b. That flood plain management guidelines be written into the Zoning By-law so that they are mandatory in the following instances:

i) in the case of undeveloped property;
ii) in the case of large developments involving an area of one city block, or greater;
iii) in the case of spot development which is located in a block where the majority of property owners have already recognized the flood plain management guidelines in their developments."

According to policy "b.i)" above, construction on undeveloped properties shall be subject to the floodplain management policy guidelines, and yet under policy "b.iii)" development is, in fact, permitted without any restrictions as there is no prior "majority" of property owners who have complied with these guidelines.

Therefore, large numbers of undeveloped parcels existing in the floodplain can be developed without having to comply with this policy. Clearly, an inconsistency exists between "b.i)" and "b.iii)" of the current policy.

On the basis of the above, it seems that a well-defined policy is needed to manage development in the flood prone areas of the city. Floodplain management policies that would control structural aspects of buildings in the floodplain may be challenged as being economically unjustified but the risk of increased cost should be weighed against the potential hazard of property damage or threat to life. Therefore, it is of vital importance that floodplain management policies be continued and that they be more specific, and firm and practical in application.

B1.2.1.5 Alternatives for Reducing Flood Damages:

B1.2.1.5.1 Policy Measures:

Potential flood damages can be reduced by land use planning in combination with other appropriate regulatory measures such as land use control and building regulations. Such measures either prohibit developments facing high risk, or else specify the measures which should be taken in the design and construction of buildings.

Floodplain management controls and land use planning can be implemented through Area Structure Plans, Area Redevelopment Plans and the Land Use By-law under The Planning Act, 1977, and through construction and fill regulations under The Land Surface Conservation and Reclamation Act. When applied, such procedures minimize the need for large capital costs for flood protection measures involving the construction of dams, dykes, and large scale land acquisition. Development in new subdivisions is often constructed on fill raised above the designated flood level. This technique is used most extensively for flood-proofing new buildings in Canada. It does not require design modifications, and if the designated flood level is exceeded, the depth of water over the fill will be shallow and of short duration. The major disadvantages of these measures are the time and costs of developing and administering them.

B1.2.1.5.2 Engineering Works:

Corrective measures such as dams, reservoirs, dykes, channel improvements and other engineering works can modify the effect of a flood on existing and future developments, but most of these engineering alternatives are exceedingly costly and can only be justified in a restricted number of situations. Too much reliance on engineering flood damage reduction measures can, in fact, result in increased damages. Once a flood control measure is implemented public perception of the flood hazard disappears whilst the hazard may not. New developments in the flood prone areas then become very susceptible to unexpected serious damages.

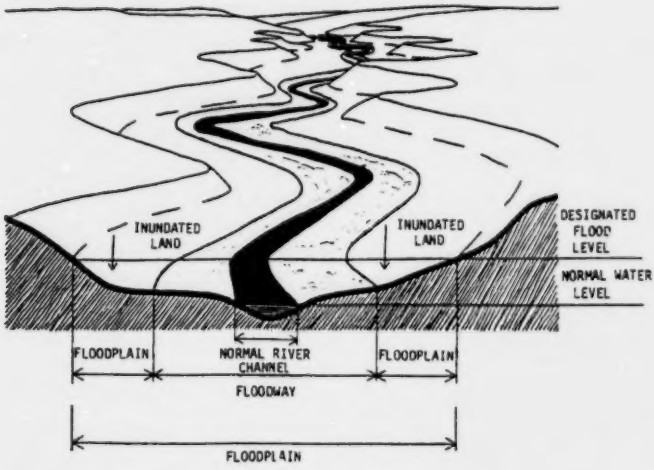
B1.2.1.5.3 Alleviative Measures:

Flood damage reduction can also be achieved by introducing flood warning systems and watershed management. These measures are predominantly concerned with reducing flood damages and are, therefore, attractive as a minimum amount of inconvience to existing floodplain users (residents and/or land owners) is involved. However, these measures are particularly contentious due to the

complex system of interrelationships existing between such factors as cost and effectiveness (e.g., Flood Insurance Schemes cannot reduce flood damages, and Flood Warning Systems cannot effectively reduce damages to permanent structures existing in the flood prone areas).

For more detailed discussion regarding the advantages and disadvantages of various alternatives for reducing flood damages and financial losses resulting from flooding, reference should be made to Sections B2.1.6 and B2.1.7 of the 'Development of Policies' respectively.

B1.2.1.6 Flood prone areas adjacent to the city's watercourses consist of a floodway area abutting the watercourses and a floodplain area immediately adjacent to the floodway. In the event of a major flood, the hydrological significance of these areas differs since the former is critical to the passage of floodwaters whereas the floodplain areas are primarily subject to inundation. The floodplain management policies for development in the floodway and floodplain areas reflect this difference. Floodway and floodplain areas are illustrated below in schematic form.



NOTES: "Floodway" must be available for the passage of floodwaters in in the event of a designated flood.

Part of the "Floodplain" outside the floodway is not subject to fast flowing floodwaters but is inundated.

The floodway and floodplain limits referred to in this report are those included in the "City of Calgary Flood Study, Volume 1, Bow River Report", May 1973, which was prepared by the Montreal Engineering Co. Ltd. for the Alberta Department of the Environment and the City of Calgary. For the Elbow River, these limits were delineated by Monenco Consultants Ltd. in their "Elbow River Flood Study", December 1979, prepared for the Alberta Department of the Environment. Floodplain limits for the Nose and West Nose Creeks are as delineated in the "Nose Creek Floodplain Study," September 1980, prepared for the Alberta Department of the Environment by Hydrocon Engineering (Continental) Ltd.

In the case of the Elbow River and Nose and West Nose Creeks, the designated flood levels (20,300 c.f.s. for the Elbow River downstream from Glenmore Dam; 3,231 c.f.s. and 1,339 c.f.s. for the Nose and West Nose Creeks respectively) are based on a 1% probability of occurrence. However, the designated flood level for the Bow River (80,000 c.f.s. above its confluence with the Elbow River and 110,000 c.f.s. below the confluence) is based on a 1.4% probability of occurrence.

The 1% probability means that a major flood of designated magnitude may occur once in 100 years or that there is a 1% chance of such a flood in any year. In a similar manner, the 1.4% probability means that a major flood of the designated magnitude for the Bow River may occur once in 70 years or that there is a 1.4% probability of occurrence in any year.

Normally, the 1% probability of occurrence, based on a flood of specific designated magnitude, is a 'standard' adopted by some provinces and accepted by the Government of Canada. In order to 'standardize' the percentage probability of flood occurrence, the Alberta Department of the Environment is considering upgrading the present 1 in 70 year (1.4%) flood to 1 in 100 year (1%) probability flood with a designated magnitude for the Bow River. Although no exact timing has been indicated for the completion of such a study, the City of Calgary will be advised when the study is completed.

As this is the only suitable information available for the Bow River at this stage, it is advisable to continue using the current 1 in 70 year (1.4%) floodway and floodplain limits for the Bow River, until such time as the Alberta Department of the Environment has actually completed their study. When the study is completed the floodplain management policies included in the Calgary River Valleys Plan will still apply. However, the City of Calgary will need to update the Land Use maps to incorporate the 1 in 100 year (1%) probability floodplain and floodway limits for the Bow River.

It is further noted that the Alberta Department of the Environment study of the Nose Creek Basin will include the following:

- determination of the feasibility of regulating the flow of Nose and West Nose Creeks;
- assessment of water quality and erosion problems and potential, and the examination of possible mitigative measures;
- development of a stormwater management policy for the basin, particularly with respect to the City of Calgary.

It is estimated that the above study will be completed by the end of 1981.

B1.2.1.7 Public Concerns:

At the public meetings held in November 1978, January 1979, and Open Houses held in May/June 1979, opposition to floodplain management was expressed by the floodplain users (residents and/or land owners). Generally, the floodplain property owners were not convinced about the possibility of a major flood through the City of Calgary. Citizens were also concerned about land use by-laws which could result from the Calgary River Valleys Plan and that such by-laws could restrict development on lands adjacent to the rivers causing properties to depreciate in value. In addition, it was felt that the present flood forecasting system should be improved and there should be a Government Flood Insurance Scheme.

B1.2.1.8 Discussion:

Many parts of Canada and the U.S.A. experienced floods during the spring of 1979. In Canada, flooding was most serious on the Red River in Manitoba. The City of Winnipeg escaped by virtue of the existence of a "floodway" - in this case an artificial overflow trench that ringed the city. The level of flooding was comparable to the devastating flood of 1950 and 10,000 people were ordered evacuated. In Alberta, ice jams on the Athabasca River resulted in floods in Fort McMurray which necessitated the pumping of raw sewage into the Clearwater and Hangingstone Rivers. According to Alberta Disaster Services, the urban flooding costs for Alberta (excluding administrative costs) for the fiscal year of 1979 were $339,635.00. During that year flooding costs in Calgary were $124,305.00, more than one-third the total costs for the province.

In the United States, floods of varying degrees of severity affected parts of North Dakota, Mississippi, Alabama, Louisiana, Minnesota, and Texas. The most severe flooding occurred on the Red River in North Dakota and on the Pearl River in Mississippi with estimated damage costs of $66 million and $500 million, respectively.

The following is an additional example of flooding which may be germaine to the City of Calgary.

On June 9 and 10, 1972, Rapid City, South Dakota experienced a flood. This city is situated adjacent to Rapid Creek which rises in the Black Hills. There was considerable urban development in the floodplain including motor home courts, residential subdivisions, industrial uses and a nursing home. As a result of the flood, about 1,500 homes and 200 businesses were affected; 239 people perished and 4 bodies were never recovered. A week later, the creek flooded again and two more people died.

Subsequently, with the help of funds raised partially by the City and largely by the Federal Government, all development was removed from the floodplain (about 4 blocks on either side of the creek and 5 miles/8 km long throughout the city) for the creation of open space. This open space now includes various types of year round recreational facilities.

The following are some of the comments made by the then Mayor of Rapid City, Mr. Barnett, at a seminar sponsored by the Ontario Ministry of the Environment in 1977.

Re: Urban Development in the Floodplain

- "the tragic cycle of land use in the urban floodplain."
- "the horrible example of how not to manage a floodplain in an urban area."
- "violation of the floodplain in a horrible and suicidal manner."

Re: The Night of the Flood

- "a gruesome and agonizing period of death and terror."

Re: Lessons Learned from the Flood

- "We reached the conclusion that the floodplain was a pretty stupid place to sleep and a stupid place to work. We also reached the decision that the floodplain was a fantastic opportunity to improve the quality of life with the outdoor recreational experience."

Re: Public Perception of Flooding Hazard

"You can say it can't happen to you,
well I say it can happen to you."

The fundamental objective of the policy is to minimize potential loss of life and flood damages to future developments and the related financial losses. Also, in view of escalating land values and their impact on housing prices, the merit of development opportunities in the floodplain has been taken into account while determining policies regarding development in the flood prone areas.

Although the floodplain management policies when applied to new development and redevelopment can cause socio-economic problems in older, low density residential areas adjacent to the rivers, it will be unwise to ignore any action with respect to reducing flood damages occurring in the City of Calgary. If no suitable corrective measures are taken, flood damage costs will be substantial and cost figures will keep increasing.

In order to reduce flood damages, future policies should be applied consistently and equally to all flood prone areas. To effectively enforce flood damage reduction policies it is essential to incorporate these policies into the Land Use By-law and the Calgary General Municipal Plan, accordingly. It is emphasized, however, that the policies should not be retroactive because such an action will not be totally practical and, as a result, it will not adequately reduce flood damages occurring to the existing developments. In the case of detached single-family houses in the flood prone areas of the existing older developed communities adjacent to the watercourses, the structural controls are not mandatory. Advisory guidelines (refer to Section C1.2.2 of 'The Plan and Policies') should be provided to all land owners/developers proposing construction in the floodplain areas in the City of Calgary. Therefore, the floodplain management policies should have little or no adverse effect on the majority of the existing communities adjacent to the rivers/creeks. As a result, property values may temporarily be affected only to recover and stabilize.

It is vital that compatible land uses for the floodway areas be established because this area is critical to the passage of a major flood. It is also essential to clearly differentiate between land uses to be permitted in the floodway and uses on adjacent lands. Land uses in the floodplain and floodway areas can be controlled simply by establishing floodplain management policies as overlay conditions (rules) included in the Land Use By-law.

According to the floodplain management policies, no buildings or other structures will be permitted in the floodway, unless deemed by the approving authority to be non-obstructing or unless otherwise stated in the Land Use By-law. New development and redevelopment abutting the watercourses will be required to provide development (building) setbacks from the edges of the Bow and Elbow Rivers, and the Nose and West Nose Creeks. In older developed areas, the riverbank land within the required development setbacks remains in the name(s) of land owner(s) affected, unless there is a change in existing land uses and, in which case, the City will negotiate for the acquisition of riverbank land. In newly developing areas abutting the watercourses, the City will negotiate for the acquisition of riverbank land within the development setbacks required.

Furthermore, institutional uses with residential components such as hospitals, senior citizens' homes, homes for the mentally or physically ill should not be permitted in the flood prone areas because of potential

problems in the event of evacuation. Similarly, mobile home parks or such with structures that may be readily carried away by floodwaters and cause damage to other properties, should not be allowed in the areas subject to flooding.

In view of the foregoing, the existing Bow View Nursing Home in Montgomery and the Bow Bend Trailer Court adjacent to Shouldice Athletic Park south of the Trans Canada Highway West will become non-conforming land uses upon the inclusion of the overlay conditions (rules) in the Land Use By-law. It should be noted that according to the Montreal Engineering Company report, May 1973, the following measures were recommended concerning the aforementioned developments:

"a. Bow View Nursing Home: consideration be given to changing the use of the building posing less risk of loss of life.

b. Bow Bend Trailer Court: removal and relocation at an early date."

The above recommendations were adopted by City Council on June 24, 1974.

As previously mentioned, the current floodplain management policy has been applied in the Bow Village, Point McKay, Eau Claire, Federal Government office building in the downtown, and Deer Run developments. To date, no major problems have been experienced. In a similar manner, overlay conditions (rules) have been established for developments in the airport vicinity and are currently applied with success.

B1.2.1.9 Justification for the Development Controls:

The standards are based on the following statutes and considerations:

a) The 200 foot/60 m and 100 foot/30 m development setbacks required from the edges of the watercourses in accordance with the Calgary General Municipal Plan (1979), are retained to minimize adverse environmental impact and are based on the current floodplain management policy of City Council, and include consideration of the following criteria:

1. location of floodway limits;

2. reduction of flood damages;

3. minimization of economic and social hardships concerning new development and redevelopment in the flood prone areas;

4. preservation of existing creek/riverside vegetation, wildlife and water quality;

5. public access; and

6. confirmation of creek/riverbank stability.

Although the individual and composite requirements of the above criteria are variable, the development setbacks are a realistic compromise which satisfy most circumstances.

b) For areas with existing development, the development setback of one-third the property depth from the edges of the rivers or the floodway limit plus 20 ft./6 m, whichever is greater, is designed to minimize social and economic hardships to existing small residential property owners. It is based on a consideration of the size of existing R-1 and RR-1

residential lots, and accommodates redevelopment on most such lots abutting the rivers.

c) The development setback of the floodway plus 20 ft./6 m for principal buildings on parcels of land abutting the southern edge of the lagoon adjacent to Prince's Island is proposed in consideration of the extremely high cost of land in this area. This development setback will ensure that sufficient area is maintained for the passage of floodwaters in the event of a major flood, and will facilitate appropriate integration of future public and private open space, resulting from downtown developments, as complementary land uses.

d) A detached single-family house (additions to or partial redevelopment of) is exempted from complying with Policy B.1(i) of the floodplain management policy because it will require special design modifications due to the lack of necessary anchorage and the massiveness required to resist lateral forces resulting from ground water pressure in the event of a major flood. This will also help to maintain the present overall character of existing riverside residential communities.

B1.2.1.10 Conclusion:

The floodplain management policy is based on land use planning and development controls. This is in accordance with concerns outlined in the Calgary General Municipal Plan (1979), and the report of the Standing Committee of City Council on Operations and Development (June 1974) as well as the "Calgary Regional Plan", 1980 (to date not ratified by the Minister).

The major advantages of adopting a predominantly land use approach to floodplain management are its comprehensiveness and flexibility. Once established, susceptible areas are subject to compatible land uses which will help to safeguard life and minimize damage costs to the Province of Alberta, the City of Calgary, and citizens in the event of a major flood. The basic land use planning framework can stand by itself as a viable approach to floodplain management. If desired, additional measures can be added without detracting from its use and effectiveness. As it is complementary to all other alternatives, it would not be rendered obsolete by their adoption. It should be noted that future floodplain and floodway limits for the Bow River may or may not change considerably, but revision to the floodplain management policies related to development controls stated in the Calgary River Valleys Plan may not be necessary.

B1.2.2 CRITERIA FOR DETERMINING THE COMPATIBILITY OF FLOODWAY USES

B1.2.2.1 Floodway Definition:

The present channel plus those portions of land needed to convey a designated flood of 80,000 cubic feet per second for the Bow River upstream of its confluence with the Elbow River, 110,000 cubic feet per second (with a probability of occurrence of 1 in 70 years/1.4%) downstream from the confluence (Montreal Engineering Co. Ltd., "The City of Calgary Flood Study, Volume 1, Bow River Report," May 1973); and 20,300 cubic feet per second (with a probability of occurrence of 1 in 100 years/1%) for the Elbow River downstream from Glenmore Dam (Monenco Consultants Ltd., "Elbow River Flood Study", December 1979), without unreasonably raising the upstream water levels above natural levels that would exist if the channel were well maintained.

B1.2.2.2 Factors Considered:

a) Type of land uses, related to the actual use of the rivers/creeks:

Land uses such as trails, parks or natural areas in the floodway are suitably related to water-based recreation such as boating, canoeing, rafting, kayaking and fishing on the rivers. In integrating land and water-based recreational activities potential conflicts must be avoided, e.g. a picnic area should not be located immediately adjacent to a popular fishing stretch. In doing so, the recreational needs of different communities can be served properly.

b) The impact of land uses on the natural environment of the rivers/creeks (conservation and enhancement potential):

Any possible impact of land use on adjacent watercourses should be recognized as a major concern specifically with respect to environmental pollution. Land uses allowed in the floodway should have potential in terms of conservation and enhancement of the natural environment of the rivers/creeks and their use, so that any damage is either minimized or eliminated. Land uses should be compatible with water-based recreational activities and should not pose a major threat to wildlife or adversely affect the quality of water. Such uses include natural areas, golf courses and other types of related general open space that have no negative impact on the natural environment of the rivers/creeks.

c) The effect of the floodway limits on adjacent land uses:

It is emphasized that no development of a structural nature (excepting utilities, river crossings) be permitted in the floodway, unless deemed by the approving authority to be non-obstructing or unless otherwise stated in the Land Use By-law, as this may impede the free flow of floodwaters. In view of the above, the extent of the floodway must be considered in the location of adjacent land uses.

d) Environmental impact of development on the floodway and its use:

In determining the compatibility of floodway uses consideration must be given to any possible negative impact which proposed development may have on the floodway or its actual use. Future land uses should not damage existing natural vegetation or adversely affect the general natural setting of the creek/riverbanks. Public recreational facilities such as pedestrian walkways/pathways should be carefully located in relation to natural areas and to any other existing development adjacent to the creek/riverbanks to avoid vandalism and to minimize any threat to wildlife existing in natural areas.

e) Flood damage potential:

Any development permitted in the floodway should be of a nature that will not result in high damage costs or require major relocation in the event of a major flood. Open space uses requiring no structures are the most appropriate use of floodway land since the damage costs incurred in a flood will be relatively low.

f) Potential hazard to downstream properties and other features in the event of a major flood:

Developments of a structural nature pose a serious threat to downstream properties and other features and would also have a negative effect on the upstream channel.

g) Location of uses in relation to natural processes of rivers/creeks:

Since water is a powerful erosive agent which always takes the line of least resistance, careful consideration must be given to the natural processes of rivers/creeks - the stage of life cycle, morphology, and fluvial processes. Areas which are susceptible to undercutting, slumping, or eventual separation from adjacent lands should be identified and retained as natural areas or public open space with no structures.

h) Whether floodway land uses facilitate public access to the rivers/creeks:

In the case of major riverside open space uses such as golf courses, public parks, semi-natural areas and picnic grounds, public access to and along the watercourses is normally available. This access is provided either in the form of pedestrian walkways/pathways or service roadways for vehicles. Generally, open space uses minimize potential conflict between public access and designated land uses.

i) Traffic generations (pedestrian and vehicular) as a result of floodway uses:

Although it is desirable to provide public access to the watercourses, precautions must be taken to prevent heavy volumes of vehicular or pedestrian traffic which may have adverse impact on the creek/riverbanks and adjacent areas of environmental value. Heavy vehicular traffic may conflict with pedestrian use and cause environmental pollution. Intensive pedestrian use can cause trail and creek/riverbank denudation and involves a high risk of vandalism. Therefore, wherever feasible, vehicular and pedestrian uses should be segregated and pedestrian areas likely to receive extensive use should be carefully located in relation to private properties and environmentally significant areas.

B1.2.2.3 Based on the above, some examples of compatible floodway uses are listed below:

(a) general open space for active or passive recreation purposes without shelters or structures
(b) public parks
(c) golf courses excluding structures or shelters
(d) flora and fauna preservation areas
(e) trails (pedestrian, cycling, equestrian) without structures
(f) fish farms
(g) botanical gardens
(h) boat/canoe launching sites
(i) horticultural nurseries
(j) vegetable gardens
(k) public utilities adjacent to and across the rivers/creeks
(l) farm of not less than 40 acres (26 ha)

(m) the use of riverside land for surface parking lots which are related to public recreation facilites should be permitted, provided that suitable landscaping is included in the development of such parking lots.

NOTE: The land use under the original land use designation shall, however, remain the principal land use in the floodway areas.

B1.2.3 POLICY GUIDELINES FOR THE REMOVAL OF INCOMPATIBLE RIVERSIDE LAND USES EXISTING IN AND ADJACENT TO THE FLOODWAY

B1.2.3.1 Review of Existing Policy:

On June 24, 1974 City Council adopted its current floodplain management policy including policy guidelines regarding the removal of "incompatible riverbank uses" which are stated below:

Floodway:

> "That a policy be adopted to encourage the relocation of incompatible industrial development from the floodway and floodplain."

Incompatible Riverbank Uses:

> "That the City adopt a policy for removal of incompatible riverbank use, commencing in 1975 and spread over a ten year period, and that the Provincial Government be requested to cost-share in the program."

In reference to the above policies, incompatible riverbank uses mentioned are gravel mining operations, feed lots, oil refineries and other industrial concerns incompatible with riverbank land in an urban setting; dumping, storage and use of hazardous materials in the floodplain. Additionally, land uses that are considered incompatible include gravel processing, manufacturing of concrete products, commercial parking lots, manufacturing of toxic goods, dumping of garbage and trash, gas service stations, auto-body repair shops, car sales and service lots, railway yards and other similar industrial uses. Such uses normally have a negative impact on the riverine environment in an urban setting in terms of aesthetics and pollution problems.

Since the adoption of the above policies by City Council in June 1974, relocation of incompatible riverbank uses or rehabilitation of gravel pits through reclamation has not occurred on a voluntary basis. Enforcing a specific rehabilitation program will not be a practical approach in this regard because the parties involved will not have the opportunity for proper negotiations. Currently, there are no major incentives offered to encourage industries or other commercial businesses to relocate to other areas with adequately serviced land owned by the City. As the City does not own sufficient serviced industrial land to offer in exchange, in areas most suitable for the industries involved, this alternative is not practical.

Another factor that most likely prevents the City of Calgary from implementing the relocation or removal of incompatible industrial riverbank uses is the substantial cost associated with these major undertakings.

However, it is noted that the City of Calgary has, on an opportunity basis, purchased about 350 acres (142 ha) of land adjacent to the Bow River (Imperial Oil site and P. Burns Ranches).

B1.2.3.2 Discussion:

Along the Elbow River there are only a few locations adjacent to 9 Avenue S.E. Bridge where the existing industrial uses are incompatible with the riverbank land in a urban environment. In the case of Nose Creek, industrial development is located close to the creek channel without adequate setbacks. These development sites are poorly maintained (e.g. north and south of McKnight Boulevard).

Riverside land uses such as public parking lots in many instances are associated with recreational nodes such as Bowness Park, William Pearce Estate and the Zoo along the Bow River; and Glenmore Athletic Park, River Park/Sandy Beach, Stanley Park and Lindsay Park along the Elbow River. These parking areas form an integral part of the overall functioning of the above parks. In these cases, proper landscaping (trees, shrubs and/or berms with suitable plantings) can be provided so that they blend suitably with the surrounding land uses. In view of the foregoing, such parking amenities should be accepted as compatible with the riverside land.

Incompatible industrial uses adjacent to the Bow River are: feed lots, oil refineries, and gravel mining and processing activities which cannot be adequately treated in order to eliminate environmental concerns regarding aesthetics, odour, noise and pollution problems. In this case, although certain remedial measures might have been taken to reduce or alleviate these concerns, no improvements of any significance have been noted to date. A number of major incompatible industrial uses are partially located in the floodway of the Bow River.

B1.2.3.3 Public Concerns:

It is generally perceived that the least desirable land use is polluting industry located in the valleys. Citizens have expressed their desire to curb industrial development adjacent to the city's watercourses because of potential pollution and access problems. Additionally, citizens felt that existing industrial developments adjacent to the rivers/creeks are poorly maintained, and future industrial development along Nose and West Nose Creeks will cause further deterioration of the water quality and creek valleys. Citizens have stated that industries should be forced to move from riverside property and relocate in areas less desirable for family life. Moreover, the public felt that no industrial uses should be permitted upstream from water reservoirs.

The Calgary River Valleys Plan Questionnaires were made available to the general public at the Open Houses held in May/June 1979.

Question No. 3 asked:

> "Should incentives be offered to encourage industries, institutional and commercial businesses to relocate from lands adjacent to Calgary river banks to other areas of the city?"

Out of approximately 500 questionaires received, 79% of respondents answered 'Yes'; 15% 'No'; and 6% were 'Undecided'.

B1.2.3.4 Conclusion:

It is appropriate for the City of Calgary to continue with its present policy of acquiring land to facilitate the gradual removal of the existing incompatible riverbank uses. It must be emphasized, however, that regarding incompatible industrial uses existing in the floodway, the City of Calgary should request the Province to share in the cost of acquisition as it is the intention of the Province, within their powers, to protect the flood control areas, (Section 97, The Water Resources Act - May 19, 1976) while land use planning remains under the jurisdiction of the City of Calgary. The floodway can be protected through instituting land use planning and suitable controls regarding development taking place in these areas.

To prevent future incompatible land uses in and adjacent to the floodway, it would be advisable to include overlay conditions (rules) in the Land Use By-law. No other uses should be permitted in this area, except compatible floodway uses, examples of which are listed in Section B1.2.2.3.

In the event of industrial development occurring in areas immediately adjacent to the floodway of the Bow River in the southeast part of the city and in the Nose Creek valley, only restricted light industrial uses should be permitted. Industrial development should be subject to development controls based on performance standards, exterior architectural treatment, and height restrictions in relation to existing development adjacent to the river/creek valleys in accordance with the guidelines in Section B3.1.

B1.3 TRANSPORTATION CORRIDORS ADJACENT TO THE WATERCOURSES:

With the exception of West Nose Creek, the major transportation arteries along Calgary's watercourses (including the C.P.R. line paralleling Deerfoot Trail along Nose Creek) while conveying high intensity vehicular traffic and permitting limited recreational driving are simultaneously encroaching on creek/riverbank parklands, polluting the riverine environment and have become effective barriers restricting pedestrian access from the adjacent residential communities to the rivers. Such access as exists is often inconvenient and very hazardous, especially for the elderly.

Many of the transportation corridors are currently situated close to the creeks/riverbanks (refer to 'Development of Policies', Section, B3) and with future road widenings will further reduce the width of creek/riverbank parkland in certain sections. This was a major concern expressed by citizens at public meetings. However, it should be noted that it may be uneconomical, in terms of land purchase and the possible relocation of people, to widen the existing riverside transportation corridors away from the rivers/creeks.

Protecting a usable parkland strip for recreational activities is important and can be assured by establishing minimum setbacks, expanding roads in the direction away from the creek/riverbanks, where feasible, and accommodating widening by retaining some land within the right-of-way as a buffer strip to prevent encroachment of riverside parkland. In view of the foregoing, all road rights-of-way should be carefully determined.

B2 WATER RELATED CONSIDERATIONS

B2.1 WATER-BASED RECREATION

Water-based recreation refers to those activities dependent upon some form of contact with water. At present, these include wading, rafting, canoeing, and fishing on Calgary's rivers as well as swimming at restricted locations.

Since there are relatively few lakes and rivers in southern Alberta, existing water resources experience high intensities of recreational use, particularly those in urban areas.

On the Elbow River as well as in certain sections of the Bow River, primary (body) contact water-based activities are possible. However, water quality in the Nose and West Nose Creeks is poor and opportunities for water-based recreation are limited at present. The feasibility of encouraging water-based recreational activities in the Nose Creek Basin is currently being examined in an Alberta Department of the Environment water quality and storm water management study (refer to 'Development of Policies', Section C1.5) to be completed in 1981.

A number of limiting factors which include a lack of public access, water temperature, quality, and velocity and depth, and waterflow fluctuations restrict water-based recreation in the city (refer to 'Development of Policies', Section C1.6). Because of the aforementioned limiting factors canoeing, rafting, and fishing have become the predominant water-based sports in Calgary's rivers.

Since canoeing has no adverse effects on the rivers and complements other riverside recreational activities, it would be desirable to establish canoe launching sites on the Bow and Elbow Rivers as well as a whitewater canoe training course at an appropriate location on the Bow River including a chute to bypass the weir.

Canoe launching sites have been appropriately located along the Bow River (refer to the land use concept plans) where the river current is moderately slow and the gradient of the riverbank sufficiently shallow to permit easy launching and retrieval of canoes by recreationists. The location of the launching sites will avoid any conflict between public and private ownership and with environmentally sensitive areas. In addition, the locations will facilitate the maximum use of regional open space facility components, such as parking and picnic areas, and will provide enjoyable recreational canoeing between regional recreational nodes. To facilitate convenient unloading and loading of canoes, parking areas should be located close to the launching sites.

As a major recreational asset, fishing should be encouraged while simultaneously paying greater attention to the interrelationships of different species and environmental conditions to ensure the continued viability of fishing as a sport in Calgary's rivers. This is particularly important with respect to the Bow River which has been identified as one of the two best trout streams in North America (A.J. McLean, 1975).

In light of the current limited opportunities for water-based recreation, the development of natural and artificial lagoons to facilitate multiple recreational activities should be encouraged e.g. swimming and skating. Consequently, consideration should also be given to facilitate special interest groups or organizations involved in promoting water-based recreational activities including boat rental facilities. Possible locations are presented in Section C1.8.3 of the 'Development of Policies' and indicated on the land use concept plans.

B2.2 WATER QUALITY

The quality of water in the Bow River downstream from the Bonnybrook Sewage Treatment Plant is very poor since the greater percentage of industrial and municipal effluents, including those from the Bonnybrook and Fish Creek Sewage Treatment Plants, are discharged into this part of the river.

The Bonnybrook Sewage Treatment Plant provides secondary treatment for approximately 90% of the city's sanitary wastewater, the remainder being similarly treated at the newly expanded Fish Creek Plant. At present, although effluent water quality standards established by the Alberta Department of the Environment are met, the surface water quality objectives (notably nutrient parameters) have not yet been attained. However, it is noted that a study aimed at demonstrating the degree of alleviation of organic pollution that will result from incremental reduction of nutrient loadings has been underway since 1979.

The following table shows the daily average river loading of biochemical oxygen demand (B.O.D.) for the two sewage treatment plants.

	1977 B.O.D./Day	1978 B.O.D./Day	1979 B.O.D./Day	1980 B.O.D./Day
Bonnybrook (Secondary) Treatment	2892 kg 6362 lbs	4981 kg 10981 lbs	4213 kg 9269 lbs	4810 kg 10582 lbs
Fish Creek (Secondary) Treatment	5790 kg 12765 lbs	5814 kg 12818 lbs	7039 kg 15486 lbs	2760 kg 6072 lbs

Source: Alberta Department of the Environment, Water Quality Control Branch.

In view of the above information, it seems that these daily average river loadings increase with city growth.

The City of Calgary is presently in the process of upgrading the Bonnybrook Sewage Treatment Plant with the objective of reducing or, if possible, eliminating water pollution problems associated with the Bow River. As part of this expansion, priority consideration will be given to the removal of phosphorus from sewage effluent. The commitment to phosphorus removal together with a funding plan was announced by the Minister of the Environment in February 1980. According to current construction schedules, installation of phosphorus removal is slated for spring 1982. Therefore, further environmental improvements will begin in early 1982 when advanced wastewater treatment (phosphorus removal by chemical precipitation with alum) is implemented at both Calgary sewage treatment plants.

Water quality in the Elbow River is good; however, because of storm sewers emptying into the Elbow River below Glenmore Reservoir, it can be expected that during storm events a number of constituent concentrations rise above

surface water quality objectives. The Nose and West Nose Creeks are seriously polluted. As part of the Nose Creek Basin Study currently being undertaken by the Alberta Department of the Environment, possible mitigative measures will be examined, in accordance with the Provincial Standards.

In light of the city's rapid growth, it is extremely important that the water quality of Calgary's rivers and creeks continues to be monitored on a regular basis, using sophisticated technology.

B2.3 WATER FLOW LEVELS

Currently, the Bow and Elbow Rivers and their tributaries all experience fluctuations in their water flow levels. These variations (refer to 'Development of Policies', Section C3) may be attributed to seasonal climatic changes or human activities. The resulting low water flow levels may be detrimental to the quality of aquatic life in these watercourses and, in the case of the Elbow River, greatly reduce opportunities for recreational canoeing or rafting.

The amount of water discharged from the Glenmore Dam on the Elbow River must be carefully controlled to ensure an adequate potable water supply to meet the city's needs and to provide a measure of flood protection downstream from the dam. Within these vital constraints, every effort is made to control the water level in Glenmore Reservoir and to maintain adequate water flows in the Elbow River downstream of the dam to accommodate various recreational activities.

The Alberta Department of the Environment water quality and storm water management study presently being conducted will assess the feasibility of installing weirs on Nose and West Nose Creeks to control water flow levels.

B3 PRESERVATION AND ENHANCEMENT OF THE RIVERINE ENVIRONMENT

B3.1 AESTHETICS

A significant feature of the river corridors and creek valleys is their scenic value to both residents of and visitors to the city. The presence of various landscape features such as steep escarpments, farmlands, and natural areas heighten the visual appeal afforded by these river/creek valleys.

Opportunities for recreational driving are limited along the banks of much of the watercourses since the adjoining roadways are provided with multi-lanes for high intensity uses. In addition, there exist aesthetically offensive industrial land uses and/or utility corridors (e.g. a high voltage overhead power line in the Nose Creek valley) along the banks of the rivers and creeks (refer to 'Development of Policies', Section D1). Adjacent to these developments, in some areas, the creek/riverbanks are unattractive primarily due to neglect, littering, the dumping of trash, and the poor quality of rip rapping. In the case of West Nose Creek, a further negative impact arises from the indiscriminate use of all-terrain vehicles.

Some guidelines should be established to determine the appropriate location of future uses within the valleys. The objective is to create a harmonious pattern of development in the valleys which will reflect a gradual transition in terms of scale and compatibility of future riverside uses in an urban setting. Future land uses within the valleys can be based on the following guidelines for development:

a. Protect rivers/creeks from environmental conflicts;

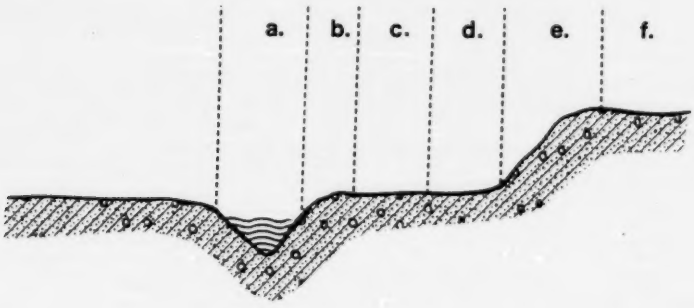
b. Maintain floodway with open space uses (private or public) without environmental concerns;

c. Encourage land uses of high aesthetics and without environmental concerns. To protect public views building height should be restricted in harmony with the existing topography of the valley flat involved.

d. Allow land uses of less high aesthetic quality but compatible with the surrounding land uses and topography of the valley flat affected. Maintain and, if possible, enhance public views of the valleys.

e. Retain existing escarpments in their natural state and adhere to development setbacks as required.

f. Allow only compatible development adjacent to the valleys. Protect public views and avoid future development that has adverse impact on the landscape of the valleys.



Since recreational driving and sightseeing along much of the creek/riverbanks is limited, it becomes increasingly important that the City attempt to realize the maximum potential from public viewpoints, especially those along the top of riverine escarpments with magnificent views of the rivers/creeks and the city skyline.

In view of the above and the present rapid growth of the city, it is desirable that the current 60 ft./18 m setback required from the top of any escarpment, as contained in the Calgary General Municipal Plan (1979), be reviewed. The objective of creating development setbacks from the top of any escarpment should be to maintain the natural character of the escarpment and to ensure harmony between the river/creek corridors and adjacent development, as well as maximize scenic opportunities.

To maintain and improve the overall impression of 'naturalness' and 'openness' which characterizes stretches of the rivers and their tributaries, it is essential to protect and preserve valuable landscape elements of the scenic views as well as the viewpoints themselves. In consideration of this, the creek/riverbanks should be cleaned up, landscaped and rehabilitated. Realization of the aesthetic potential and present scenic value of the river corridors and creek valleys should involve the protection of present landscapes and the prevention, if possible, of developments which would reduce the aesthetic qualities of these riverine landscapes.

Furthermore, the objective of the Calgary River Valleys Plan is also in accordance with the general intent of the "Calgary Regional Plan", 1980 (to date not ratified by the Minister).

B3.2 NATURAL FEATURES

Distinctive natural features are present along all the watercourses in the city and greatly enhance the 'naturalness' of the riverine environments.

Both the Bow and Elbow Rivers have well defined and moderately steep banks, a number of islands and sand/gravel bars, and terrace formations along the riverbanks. A number of steep, distinctive escarpments exist along Nose and West Nose Creeks with those of the latter offering commanding views of the city skyline to the east, south and west. Oxbow lakes are present in the valleys of both creeks and are unique physical features of the area. Some of these oxbow lakes have been separated by subsequent development in the Nose Creek valley. Notable glacial erratics can be found in both creek valleys and include the 'Split Rock', which is an interesting landmark, and the erratic formerly used as a rubbing stone by buffalo in the Nose Creek valley, as indicated on the land use concept plans.

These natural features must be protected and preserved as features of historical importance and as environmental components which enhance the natural character of these riverine landscapes.

B3.3 ARCHAEOLOGICAL SITES

At present, according to the Alberta Department of Culture, there are 38 archaeological sites along the Bow and Elbow Rivers and their tributaries. All sites are in close proximity to the watercourses with 12 sites adjacent to the Bow River, 4 sites adjacent to the Elbow River, 16 sites adjacent to Nose Creek, and 6 sites adjacent to West Nose Creek (refer to 'Land Use Inventory and Analysis' - Major Environmental Resource Features Map).

To ensure the recognition and appreciation of our common cultural heritage, development affecting archaeological sites is only possible in consultation with the Archaeological Survey Branch of the Alberta Department of Culture and in accordance with the policies outlined in the Alberta Historical Resources Act enacted by the Provincial Government (refer to 'Development of Policies', Section D3).

Preservation of historically significant sites is necessary for the successful integration of cultural and historical elements into a cultural heritage and common identity.

B3.4 SNOW DISPOSAL

Under the City's current Winter Snow and Ice Control Program, the snow accumulated from city streets is dumped at 11 snow disposal sites (refer to 'Land Use Inventory and Analysis'), 7 of which are adjacent or in close proximity to the city's watercourses on unpaved, bare ground areas licensed by the Alberta Department of the Environment. At two sites (Bow Trail at 14 Street S.W. and Memorial Drive at 2 Street N.E.),the snow is discharged on the bank slopes of the Bow River and at the remaining sites is stockpiled on the adjacent land.

Prior to 1969/70 the primary snow disposal sites were located in the Bow and Elbow River channels. Since then, the City of Calgary has continually established permanent "Land Storage Sites"* to facilitate the retention of debris.

At public meetings specific concerns dealt with the damage to natural vegetation on top of the riverbanks and on the slopes, the erosion of riverbanks resulting in disturbance of their natural slope, and the aesthetic unpleasantness of snow storage sites. It is essential that damage to the existing environment as a result of snow disposal be minimized until such time as appropriate "Land Storage Sites" are established. In addition to the present policies and practices of the City Engineering Department (refer to 'Development of Policies', Section D4.2), all snow disposal sites should desirably be landscaped to enhance the aesthetics of these sites.

B3.5 DISTURBED AREAS

Disturbed areas consist of those sites where the topsoil and/or existing vegetation has been stripped, most commonly in open spaces adjacent to the Bow River. The consequent erosion is the resulting impact of various land uses which include gravel extraction, snow dumping, and the indiscriminate use of all-terrain vehicles on certain areas of escarpments. The problem is further complicated by casual attitudes towards littering and neglect, notably the outside storage of scrap material.

The aesthetic value of these visually prominent areas would be greatly enhanced, regardless of the type or magnitude of the area, through the restoration of natural appearing contours, and the reclamation and rehabilitation of the land, thus ensuring the overall natural character of the riverine environment is preserved.

It should be noted that applications can be made to the Provincial Government for a grant for the reclamation of disturbed areas.

B3.6 RIVERBANK EROSION

Based on a report by Klohn Leonoff Consultants Ltd., dated June 1979 and entitled "Calgary Rivers - Structure and Erosion Condition" (Appendix I), areas of the Bow and Elbow Rivers and their tributaries requiring remedial action have been identified and were ranked according to priority needs as follows:

Class A - those requiring immediate attention
Class B - those needing future attention
Class C - those requiring monitoring

Those areas requiring immediate attention are listed in Sections D6.1.2 and D6.1.3 in the 'Development of Policies'.

Currently, restorative measures are being undertaken by the Alberta Department of the Environment and the City of Calgary at some locations on the Bow River. Further corrective measures must be initiated at the problem areas on the Elbow River and an overall repair program for problem areas with respective remedial measures must be established. It is important that any corrective measures employed be environmentally sensitive and as aesthetically pleasing as possible with respect to the materials and techniques utilized.

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* Land Storage Sites = Sites located away from the creek/riverbanks.

B4 PUBLIC AWARENESS

B4.1 HAZARDS AND GENERAL INFORMATION RELATED TO THE WATERCOURSES AND ADJACENT CITY PARKS

Ensuring the safe and optimum use of recreational facilities and open space involves increasing public awareness of not only hazards but recreational opportunities as well.

To date, a number of signs have been erected along the Elbow River, on Prince's Island and elsewhere warning of the danger of unsupervised swimming and wading as well as the number of fatalities at these locations. However, there are some hazardous locations which have not been signposted. Further signposting is needed along cross-country ski trails and pedestrian trails to avoid inadvertent trespassing on private property and to act as directional aids.

Unfortunately, public awareness signs are necessarily visually prominent and, therefore, often out of character with the natural appearance of many riverside areas and in addition are subject to vandalism and theft. Furthermore, warning signs can create a false sense of security for the public because they assume that any location without a sign must be safe.

In consideration of these factors, it would seem most appropriate to increase public awareness via ongoing information and educational programs through the media, ads, newsletters, and the schools. In order to facilitate greater safety for the general public and to simultaneously encourage maximum recreational use of riverside recreational facilities, maps of walkways/pathways should be made available, and the degree of hazard at various riverside locations should be prioritized so that warning signs are erected only in appropriate locations where they are most critically needed.

B4.2 SOCIALLY UNACCEPTABLE BEHAVIOUR

Three main areas of expressed public concern have been identified through the public participation program. These include vandalism, theft, and other forms of socially unacceptable behaviour such as littering, molesting, and uncontrolled pets.

A few people perceived socially undesirable behaviour as a serious problem and deemed further extensions of public open space in the river/creek valleys to be undesirable. This expressed feeling is in contrast to the basic philosophy of the plan and would have negative impacts on the recreational use of public open space in the river/creek valleys. While some anti-social behaviour does exist it is not exclusive to public open space along the creek/riverbanks. In view of this, it would seem unjust to deprive the general public of access to regional open space which would decrease potential problems of overcrowding and recreational use conflicts in existing public open spaces adjacent to intensively developed areas.

To ensure optimum participation and utilization of public open spaces along the rivers/creeks for recreational activities, it is essential that the general public perceive these open spaces as safe and clean recreational areas. It is hoped that the problem may be resolved through public education, assistance programs,

enforcement, and park design, including the design of features of park layout to reduce the impacts of socially unacceptable behaviour. These would include the location of trails away from environmentally sensitive areas, installation of night lighting except where it may have an adverse impact on nocturnal fauna and adjacent flora, and the 'hardening' of sites by the provision of shale trails and asphalt roads.

C PUBLIC PARTICIPATION

Since the inception of the Calgary River Valleys Plan public participation has been an integral part of the planning process. The following synopsis indicates the public participation process followed and briefly outlines public concerns. Specific public concerns have been outlined and appropriately addressed in the relevant chapters of this report.

Initially, to promote public awareness of the Calgary River Valleys Plan, 30,000 brochures were mailed in October 1978 to residents of communities adjacent to the rivers and creeks. Subsequently, the times and places of five general public meetings were advertised in the newspapers. The meetings were held in November 1978 and January 1979. The brochures were also distributed at the meetings and further information regarding the Calgary River Valleys Plan was provided to the public; citizen comments on the Plan were invited. These public meetings were well attended and problems and opportunities related to the Plan were discussed.

Preliminary concept plans were then prepared for the Bow and Elbow Rivers and the Nose and West Nose Creeks and immediately adjacent lands. These concept plans indicated various land uses, recreational facilities, and extensions to the existing riverbank walkway/pathway system, based on low and high priorities, in accordance with existing policies of City Council.

In May/June 1979, four Open Houses were held at the Market Mall, North Hill, Chinook, and Marlborough shopping centres. These Open Houses were publicized in seven newspaper advertisements and through advertisements on Calgary Transit buses. Preliminary concept plans were displayed at the Open Houses and questionnaires and other relevant information regarding the concept plans was made available in order to secure further public input regarding problems and opportunities related to the river/creek valleys, and land uses and recreational facilities shown on the concept plans.

Approximately 500 questionnaires were returned and the responses received were analyzed. The most frequently requested uses for lands adjacent to the rivers and their tributaries were "parkland with some developed and some undeveloped natural areas," "totally undeveloped natural areas" and "single-family residential" land uses. While citizens fully endorsed the provision of regional open space in the river/creek valleys, major concern was expressed regarding the effects of walkways/pathways on

existing riverside residential communities as well as the expropriation of privately owned residential land for the expansion of the riverbank walkway/pathway system. In general, the public felt that the concept of various types of riverside land uses, including regional parks, natural areas and single-family residences was "the most appropriate planning principle." A detailed summary of public responses and concerns as prepared by the Chairperson of the Calgary River Management Citizens' Group is contained in Appendix XVII.

On August 1, 1979 a news release on the Calgary River Valleys Plan (Appendix XV) was released and additional comments from the public were solicited regarding the preliminary concept plans displayed at the Open Houses. Additionally, a newsletter outlining frequently expressed public concerns related to the Plan was released on August 31, 1979.

In September 1979, a meeting was held with industries and businesses bordering the rivers and their tributaries. Various aspects were discussed amongst resource people from the City of Calgary, the Alberta Department of the Environment, the Calgary River Management Citizens' Group and industry representatives. The meeting created general awareness of the Calgary River Valleys Plan; no specific concerns were raised.

Another meeting, also held in September, invited responses from residents of the Nose Creek and West Nose Creek communities. Major points of interest and concern included: (1) the desire to curb industrial development along the creeks because of potential pollution and access problems; (2) concern about the present quality and flow of water in the creeks; (3) support for the protection of environmentally sensitive areas; and (4) confusion over police authority and law enforcement capabilities in public parks and other open space areas. Many of the concerns voiced by those present at the meeting related specifically to the Nose Creek valley south of 80 Avenue for which a concept plan was approved by City Council on March 9, 1976 and amended in 1979.

On October 18, 1979, a special meeting was held between the Calgary River Management Advisory Committee and representatives from the Bowness, Rideau/Roxboro, Elbow Park and Riverdale Communities. The major concerns discussed included land use by-laws, the security, protection and privacy of riverside residential neighbourhoods, preservation of environmentally sensitive areas, access to the rivers/creeks, and management of water resources.

A second newsletter dated November 15, 1979 provided a synopsis of responses from the questionnaires and a more detailed review of public comments from the Open Houses and public meetings (Appendix XVI).

The Alberta Department of the Environment, the Calgary River Management Citizens' Group, and the City of Calgary were all involved in the public participation process. The interest and participation of the general public at public meetings provided invaluable insight into the concerns and comments of citizens regarding the Calgary River Valleys Plan and it was greatly appreciated.

Public input was reviewed and carefully considered in the compilation of the draft Plan. Copies of the draft

Calgary River Valleys Plan were forwarded to circulation referees and made available to the general public on December 17, 1980 for a period of three months to March 17, 1981. Community and Residents Associations bordering the study area received copies of the draft Plan for their review and comments. Other Community Associations not directly affected by the draft Plan also received copies at their request. The general circulation period was further extended by two and a half (2 1/2) months to June 1, 1981 by City Council at the request of the Elbow Park Residents' Association. During this period comments were received from four parties, which did not include any riverside Community or Residents Associations.

During the general circulation period, Planning Department staff were available for meetings to discuss comments on the draft Plan. Meetings were held with Community Associations in early March 1981, as requested. The Calgary River Management Citizens' Group, an advisory group to the general public, was also available for general information through the Group's chairman.

All comments concerning the draft Plan were received by Special Projects Division of the Planning Department and were considered in the revision of the draft Calgary River Valleys Plan.

GLOSSARY OF TERMS

Abutting: Contiguous with, actually touching, a parcel of land next to a watercourse.

Access (General): Access which has not been legalized, e.g., in southeast Calgary and along Nose Creek where no separate public walkway/pathway rights-of-way or easements exist.

Acquisition (Land): Through subdivision, redesignation, and negotiations with land owners involved.

Community: (i) A residential community of the City of Calgary e.g. Silver Springs, Hillhurst - Sunnyside.
(ii) An assemblage of populations living within a prescribed area. It is a loosely organized unit to the extent that it has characteristics additional to its individual and population components.

Dedicated Parkland (Reserve): Area normally resulting from subdivision of land in excess of 2 acres (0.8 ha) in accordance with The Planning Act, 1977.

Designated Parkland: City-owned land set aside by City Council for parks and recreational purposes.

Development: means

"(i) an excavation or stockpile and the creation of either of them, or

(ii) a building or an addition to, or replacement or repair of a building and the construction or placing in, on, over or under land of any of them, or

(iii) a change of use of land or a building or an act done in relation to land or a building that results in or is likely to result in a change in the use of the land or building, or

(iv) a change in the intensity of use of land or a building or an act done in relation to land or a building that results in or is likely to result in a change in the intensity of use of the land or building."

The above definition is in accordance with The Planning Act, 1977 (Section [1/5]) and the Land Use By-law.

Disturbed Area: An area which has resulted from the use of all-terrain vehicles, excavation and fill, snow dumping, and gravel extraction.

Environmental Reserve: Area resulting from subdivision of land in excess of 2 acres (0.8 ha) in accordance with The Planning Act, 1977, Section 95.

Escarpment: A term used loosely to describe a steep slope formed by the erosive action of water and normally adjacent to a watercourse.

Floodplain: The land located immediately adjacent to the floodway which is not needed for the conveyance of the designated flood but which is, nonetheless, subject to innundation.

Floodway: "The present channel plus those portions of land needed to convey a designated flood of 80,000 cubic feet per second for the Bow River upstream of the confluence with the Elbow River and 110,000 cubic per second downstream of the confluence; and 20,300 cfs for the Elbow River downstream from Glenmore Reservoir Dam, without unreasonably raising the upstream water levels above the natural levels that would exist if the channel were well maintained" ("City of Calgary Flood Study, Volume 1, Bow River Report" [1973] - Montreal Engineering Co. Ltd. and "Elbow River Flood Study", December 1979 - Monenco Consultants Ltd., respectively).

Habitat: A place where an organism lives.

Master Plan: Detailed land use concept plan which establishes a policy framework for a given area and provides guidelines for the preservation, development and management of the area (reference-Parks/Recreation Department)

Natural Area: A parcel of land exhibiting all of the following characteristics.

- an area of open 'green space' within the city
- predominantly covered with indigenous vegetation such as prairie grassland or riverine forest
- lacking substantial modification by man
- not in active arable or other farmland use
- containing indigenous fauna

Other City-owned Land: City-owned land other than designated/dedicated land for parks and recreational purposes.

Open Space System: A series of large open space units which are entirely contiguous or are wholly or partially connected by smaller, linear open spaces.

Primary (Body) Contact: A term used to describe certain water-based recreational activities where physical contact with the water occurs e.g. swimming, diving, wading.

Public Access: Access via registered public rights-of-way or easements through private properties, e.g. Klippert Concrete, or walkways/pathways through public creek/ riverbank lands.

Regional Open Space: Open space lands provided by the municipality for the benefit of all citizens. Public open space lands which are provided above and beyond established community open space requirements. Such lands are usually more extensive than community open space for the benefit of local residents and are intended primarily for the use and enjoyment of all citizens. In practice, regional open space units are primarily patronized by residents of nearby communities but they may attract recreationists from all over the city e.g. Glenmore Park, Bowness Park. Where regional open space units are connected to form an open space unit system, they are more likely to attract users from a wider area.

Right/Left Bank: The right/left bank of any watercourse as observed from a position looking downstream.

Riverbank: Sloping area abutting the river/creek channel.

Riverside Land: Area adjacent to creek/riverbank.

River/Creek Valley: A linear topographic depression containing flowing fresh water.

Site Plan: Any plan affecting an identified site. This may include but is not limited to the following - Site Development Plan, Ecological Plan.

Species: A genetically distinctive group of natural populations that share a common gene pool and that are reproductively isolated from all other such groups.

Water-based Recreation: Describes recreational activities which are dependent upon the presence of water or ice. This includes primary (body) contact activities such as fishing, canoeing, sailing, model boat testing and ice skating.

Water-enhanced Recreation: Describes recreational activities which are enhanced but not dependent upon the presence of water e.g. walking, picnicking, games, jogging and sunbathing.

Water-oriented Recreation: A broad generic term encompassing both water-based and water-enhanced recreation.

LIST OF APPENDICES

I CALGARY RIVERS-STRUCTURE AND EROSION CONDITION, Klohn-Leonoff Consultants Ltd., June 1979 (3 volumes).

II A POLICY CONCERNING FLOODPLAIN MANAGEMENT AND THE ACQUISITION OF RIVERBANK PROPERTY, (Current Policy of City Council), June 1974.

III NATURAL BOUNDARIES, H.J. Wilson, Deputy Attorney General, Edmonton, Alberta, February 1959.

IV CALGARY RIVER VALLEYS PLAN - A DISCUSSION OF WATER POLLUTION WITHIN THE CITY OF CALGARY, K. Exner, Water Quality Control Branch, Pollution Control Division, Alberta Department of the Environment, December 1978. (updated March 12, 1981)

V FLOW FLUCTUATIONS ON THE BOW AND ELBOW RIVERS AND THEIR TRIBUTARIES IN THE CITY OF CALGARY, W.L. Dybvig, Assistant Bow River Basin Planner, Planning Division, Alberta Department of the Environment, November 1978.

VI SPORTS FISHERIES WITHIN THE CITY OF CALGARY, W.E. Griffiths, Regional Fisheries Biologist, Fish and Wildlife Division, Alberta Energy and Natural Resources, November 1979.

VII POLICY ON DISTURBANCE OF THE NATURAL ENVIRONMENT BY PUBLIC WORKS, Clause 48 of the Report of the Standing Policy Committee on Operations and Development, October 9, 1973.

VIII VANDALISM IN PARKS, Clause CS79-10-4 of the Report of the Standing Policy Committee on Community Services, March 13 and 15, 1979.

IX THE ANTI-LITTER BY-LAW No. 6486

X THE PARKS BY-LAW No. 36/76

XI THE ANIMAL CONTROL BY-LAW No. 96/77

XII THE WEEDS, GRASSES, AND PLANTS BY-LAW No. 8766

XIII THE CALGARY RIVER VALLEYS PLAN QUESTIONNAIRE

XIV SUMMARY OF COMMENTS FROM THE QUESTIONNAIRE

XV INFORMATION BULLETIN RE PROPOSED CALGARY RIVER VALLEYS PLAN (City of Calgary)

XVI CALGARY RIVER VALLEYS PLAN NEWSLETTER, NOVEMBER 15, 1979, Summarizing public concerns.

XVII THE DETAILED COMPILATION OF COMMENTS FROM THE QUESTIONNAIRES DISTRIBUTED AT THE OPEN HOUSES HELD IN MAY/JUNE, 1979, Calgary River Management Citizens' Group

XVIII THE RIVERBANK PROBLEM - SECURITY, PROTECTION, AND PRIVACY FOR RIVERSIDE RESIDENTIAL NEIGHBOURHOODS, prepared by the Elbow Park and Rideau/Roxboro Community Associations

XIX SEMINAR PROCEEDINGS - CALGARY URBAN SHORELANDS, SEPTEMBER 1978, Alberta Department of the Environment (not held in connection with the Calgary River Valleys Plan).

XX A LETTER FROM THE ALBERTA CANOE ASSOCIATION TO THE CALGARY RIVER MANAGEMENT CITIZENS' GROUP